LINCOLN ELECTRIC

GENUINE LINCOLN PARTS™

NOTE: This manual will cover most of the troubleshooting and repair procedures for the code numbers listed. Some variances may exist when troubleshooting/repairing later code numbers.

LT-7 LIGHTWEIGHT TRACTOR

For use with machines having Code Numbers:

7429 thru 11358

SERVICE MANUAL

SVM198-A | Issue Date 10-Jul

THE LINCOLN ELECTRIC COMPANY
22801 St. Clair Avenue • Cleveland, OH • 44117-1199 • U.S.A.
Phone: +1.216.481.8100 • www.lincolnelectric.com

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

⚠ WARNING

⚠ CALIFORNIA PROPOSITION 65 WARNINGS ⚠

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

The Above For Diesel Engines

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

The Above For Gasoline Engines

ARC WELDING can be hazardous. PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. PACEMAKER WEARERS SHOULD CONSULT WITH THEIR DOCTOR BEFORE OPERATING.

Read and understand the following safety highlights. For additional safety information, it is strongly recommended that you purchase a copy of "Safety in Welding & Cutting - ANSI Standard Z49.1" from the American Welding Society, P.O. Box 351040, Miami, Florida 33135 or CSA Standard W117.2-1974. A Free copy of "Arc Welding Safety" booklet E205 is available from the Lincoln Electric Company, 22801 St. Clair Avenue, Cleveland, Ohio 44117-1199.

BE SURE THAT ALL INSTALLATION, OPERATION, MAINTENANCE AND REPAIR PROCEDURES ARE PERFORMED ONLY BY QUALIFIED INDIVIDUALS.

FOR ENGINE powered equipment.

1.a. Turn the engine off before troubleshooting and maintenance work unless the maintenance work requires it to be running.

1.b. Operate engines in open, well-ventilated areas or vent the engine exhaust fumes outdoors.

1.c. Do not add the fuel near an open flame welding arc or when the engine is running. Stop the engine and allow it to cool before refueling to prevent spilled fuel from vaporizing on contact with hot engine parts and igniting. Do not spill fuel when filling tank. If fuel is spilled, wipe it up and do not start engine until fumes have been eliminated.

1.d. Keep all equipment safety guards, covers and devices in position and in good repair.Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.

1.e. In some cases it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.

1.f. Do not put your hands near the engine fan. Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.

1.g. To prevent accidentally starting gasoline engines while turning the engine or welding generator during maintenance work, disconnect the spark plug wires, distributor cap or magneto wire as appropriate.

1.h. To avoid scalding, do not remove the radiator pressure cap when the engine is hot.

ELECTRIC AND MAGNETIC FIELDS may be dangerous

2.a. Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). Welding current creates EMF fields around welding cables and welding machines

2.b. EMF fields may interfere with some pacemakers, and welders having a pacemaker should consult their physician before welding.

2.c. Exposure to EMF fields in welding may have other health effects which are now not known.

2.d. All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:

2.d.1. Route the electrode and work cables together - Secure them with tape when possible.

2.d.2. Never coil the electrode lead around your body.

2.d.3. Do not place your body between the electrode and work cables. If the electrode cable is on your right side, the work cable should also be on your right side.

2.d.4. Connect the work cable to the workpiece as close as possible to the area being welded.

2.d.5. Do not work next to welding power source.

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

ELECTRIC SHOCK can kill.

3.a. The electrode and work (or ground) circuits are electrically "hot" when the welder is on. Do not touch these "hot" parts with your bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.

3.b. Insulate yourself from work and ground using dry insulation. Make certain the insulation is large enough to cover your full area of physical contact with work and ground.

In addition to the normal safety precautions, if welding must be performed under electrically hazardous conditions (in damp locations or while wearing wet clothing; on metal structures such as floors, gratings or scaffolds; when in cramped positions such as sitting, kneeling or lying, if there is a high risk of unavoidable or accidental contact with the workpiece or ground) use the following equipment:

- **Semiautomatic DC Constant Voltage (Wire) Welder.**
- **DC Manual (Stick) Welder.**
- **AC Welder with Reduced Voltage Control.**

3.c. In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semiautomatic welding gun are also electrically "hot".

3.d. Always be sure the work cable makes a good electrical connection with the metal being welded. The connection should be as close as possible to the area being welded.

3.e. Ground the work or metal to be welded to a good electrical (earth) ground.

3.f. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.

3.g. Never dip the electrode in water for cooling.

3.h. Never simultaneously touch electrically "hot" parts of electrode holders connected to two welders because voltage between the two can be the total of the open circuit voltage of both welders.

3.i. When working above floor level, use a safety belt to protect yourself from a fall should you get a shock.

3.j. Also see Items 6.c. and 8.

ARC RAYS can burn.

4.a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding. Headshield and filter lens should conform to ANSI Z87. I standards.

4.b. Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.

4.c. Protect other nearby personnel with suitable, non-flammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or metal.

FUMES AND GASES can be dangerous.

5.a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases.When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. **When welding with electrodes which require special ventilation such as stainless or hard facing (see instructions on container or MSDS) or on lead or cadmium plated steel and other metals or coatings which produce highly toxic fumes, keep exposure as low as possible and within applicable OSHA PEL and ACGIH TLV limits using local exhaust or mechanical ventilation. In confined spaces or in some circumstances, outdoors, a respirator may be required. Additional precautions are also required when welding on galvanized steel.**

5. b. The operation of welding fume control equipment is affected by various factors including proper use and positioning of the equipment, maintenance of the equipment and the specific welding procedure and application involved. Worker exposure level should be checked upon installation and periodically thereafter to be certain it is within applicable OSHA PEL and ACGIH TLV limits.

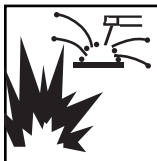
5.c. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.

5.d. Shielding gases used for arc welding can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.

5.e. Read and understand the manufacturer's instructions for this equipment and the consumables to be used, including the material safety data sheet (MSDS) and follow your employer's safety practices. MSDS forms are available from your welding distributor or from the manufacturer.

5.f. Also see item 1.b.

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC



WELDING and CUTTING SPARKS can cause fire or explosion.

6.a. Remove fire hazards from the welding area.If this is not possible, cover them to prevent the welding sparks from starting a fire. Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjcent areas. Avoid welding near hydraulic lines. Have a fire extinguisher readily available.

6.b. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situations. Refer to “Safety in Welding and Cutting” (ANSI Standard Z49.1) and the operating information for the equipment being used.

6.c. When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.

6.d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been “cleaned”. For information, purchase “Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances”, AWS F4.1 from the American Welding Society (see address above).

6.e. Vent hollow castings or containers before heating, cutting or welding. They may explode.

6.f. Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses with side shields when in a welding area.

6.g. Connect the work cable to the work as close to the welding area as practical. Work cables connected to the building framework or other locations away from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.

6.h. Also see item 1.c.

6.I. Read and follow NFPA 51B “ Standard for Fire Prevention During Welding, Cutting and Other Hot Work”, available from NFPA, 1 Batterymarch Park,PO box 9101, Quincy, Ma 022690-9101.

6.j. Do not use a welding power source for pipe thawing.

CYLINDER may explode if damaged.

7.a. Use only compressed gas cylinders containing the correct shielding gas for the process used and properly operating regulators designed for the gas and pressure used. All hoses, fittings, etc. should be suitable for the application and maintained in good condition.

7.b. Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.

7.c. Cylinders should be located:

- Away from areas where they may be struck or subjected to physical damage.
- A safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.

7.d. Never allow the electrode, electrode holder or any other electrically “hot” parts to touch a cylinder.

7.e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.

7.f. Valve protection caps should always be in place and hand tight except when the cylinder is in use or connected for use.

7.g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-I, “Precautions for Safe Handling of Compressed Gases in Cylinders,” available from the Compressed Gas Association 1235 Jefferson Davis Highway, Arlington, VA 22202.

FOR ELECTRICALLY powered equipment.

8.a. Turn off input power using the disconnect switch at the fuse box before working on the equipment.

8.b. Install equipment in accordance with the U.S. National Electrical Code, all local codes and the manufacturer’s recommendations.

8.c. Ground the equipment in accordance with the U.S. National Electrical Code and the manufacturer’s recommendations.

Refer to **http://www.lincolnelectric.com/safety** for additional safety information.

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

PRÉCAUTIONS DE SÛRETÉ

Pour votre propre protection lire et observer toutes les instructions et les précautions de sûreté specifiques qui parraissent dans ce manuel aussi bien que les précautions de sûreté générales suivantes:

Sûreté Pour Soudage A L'Arc

1. Protegez-vous contre la secousse électrique:

   a. Les circuits à l'électrode et à la piéce sont sous tension quand la machine à souder est en marche. Eviter toujours tout contact entre les parties sous tension et la peau nue ou les vétements mouillés. Porter des gants secs et sans trous pour isoler les mains.
   b. Faire trés attention de bien s'isoler de la masse quand on soude dans des endroits humides, ou sur un plancher metallique ou des grilles metalliques, principalement dans les positions assis ou couché pour lesquelles une grande partie du corps peut être en contact avec la masse.
   c. Maintenir le porte-électrode, la pince de masse, le câble de soudage et la machine à souder en bon et sûr état defonctionnement.
   d.Ne jamais plonger le porte-électrode dans l'eau pour le refroidir.
   e. Ne jamais toucher simultanément les parties sous tension des porte-électrodes connectés à deux machines à souder parce que la tension entre les deux pinces peut être le total de la tension à vide des deux machines.
   f. Si on utilise la machine à souder comme une source de courant pour soudage semi-automatique, ces precautions pour le porte-électrode s'applicuent aussi au pistolet de soudage.

2. Dans le cas de travail au dessus du niveau du sol, se protéger contre les chutes dans le cas ou on recoit un choc. Ne jamais enrouler le câble-électrode autour de n'importe quelle partie du corps.

3. Un coup d'arc peut être plus sévère qu'un coup de soliel, donc:

   a. Utiliser un bon masque avec un verre filtrant approprié ainsi qu'un verre blanc afin de se protéger les yeux du rayonnement de l'arc et des projections quand on soude ou quand on regarde l'arc.
   b. Porter des vêtements convenables afin de protéger la peau de soudeur et des aides contre le rayonnement de l'arc.
   c. Protéger l'autre personnel travaillant à proximité au soudage à l'aide d'écrans appropriés et non-inflammables.

4. Des gouttes de laitier en fusion sont émises de l'arc de soudage. Se protéger avec des vêtements de protection libres de l'huile, tels que les gants en cuir, chemise épaisse, pantalons sans revers, et chaussures montantes.

5. Toujours porter des lunettes de sécurité dans la zone de soudage. Utiliser des lunettes avec écrans lateraux dans les zones où l'on pique le laitier.

6. Eloigner les matériaux inflammables ou les recouvrir afin de prévenir tout risque d'incendie dû aux étincelles.

7. Quand on ne soude pas, poser la pince à une endroit isolé de la masse. Un court-circuit accidental peut provoquer un échauffement et un risque d'incendie.

8. S'assurer que la masse est connectée le plus prés possible de la zone de travail qu'il est pratique de le faire. Si on place la masse sur la charpente de la construction ou d'autres endroits éloignés de la zone de travail, on augmente le risque de voir passer le courant de soudage par les chaines de levage, câbles de grue, ou autres circuits. Cela peut provoquer des risques d'incendie ou d'echauffement des chaines et des câbles jusqu'à ce qu'ils se rompent.

9. Assurer une ventilation suffisante dans la zone de soudage. Ceci est particuliérement important pour le soudage de tôles galvanisées plombées, ou cadmiées ou tout autre métal qui produit des fumeés toxiques.

10. Ne pas souder en présence de vapeurs de chlore provenant d'opérations de dégraissage, nettoyage ou pistolage. La chaleur ou les rayons de l'arc peuvent réagir avec les vapeurs du solvant pour produire du phosgéne (gas fortement toxique) ou autres produits irritants.

11. Pour obtenir de plus amples renseignements sur la sûreté, voir le code "Code for safety in welding and cutting" CSA Standard W 117.2-1974.

PRÉCAUTIONS DE SÛRETÉ POUR LES MACHINES À SOUDER À TRANSFORMATEUR ET À REDRESSEUR

1. Relier à la terre le chassis du poste conformement au code de l'électricité et aux recommendations du fabricant. Le dispositif de montage ou la piece à souder doit être branché à une bonne mise à la terre.

2. Autant que possible, l'installation et l'entretien du poste seront effectués par un électricien qualifié.

3. Avant de faires des travaux à l'interieur de poste, la debrancher à l'interrupteur à la boite de fusibles.

4. Garder tous les couvercles et dispositifs de sûreté à leur place.

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

Electromagnetic Compatibility (EMC)

Conformance
Products displaying the CE mark are in conformity with European Community Council Directive of 15 Dec 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility, 2004/108/EC. It was manufactured in conformity with a national standard that implements a harmonized standard: EN 60974-10 Electromagnetic Compatibility (EMC) Product Standard for Arc Welding Equipment. It is for use with other Lincoln Electric equipment. It is designed for industrial and professional use.

Introduction
All electrical equipment generates small amounts of electromagnetic emission. Electrical emission may be transmitted through power lines or radiated through space, similar to a radio transmitter. When emissions are received by other equipment, electrical interference may result. Electrical emissions may affect many kinds of electrical equipment; other nearby welding equipment, radio and TV reception, numerical controlled machines, telephone systems, computers, etc. Be aware that interference may result and extra precautions may be required when a welding power source is used in a domestic establishment.

Installation and Use
The user is responsible for installing and using the welding equipment according to the manufacturer's instructions. If electromagnetic disturbances are detected then it shall be the responsibility of the user of the welding equipment to resolve the situation with the technical assistance of the manufacturer. In some cases this remedial action may be as simple as earthing (grounding) the welding circuit, see Note. In other cases it could involve construction of an electromagnetic screen enclosing the power source and the work complete with associated input filters. In all cases electromagnetic disturbances must be reduced to the point where they are no longer troublesome.

Note: The welding circuit may or may not be earthed for safety reasons according to national codes. Changing the earthing arrangements should only be authorized by a person who is competent to access whether the changes will increase the risk of injury, e.g., by allowing parallel welding current return paths which may damage the earth circuits of other equipment.

Assessment of Area
Before installing welding equipment the user shall make an assessment of potential electromagnetic problems in the surrounding area. The following shall be taken into account:

a) other supply cables, control cables, signaling and telephone cables; above, below and adjacent to the welding equipment;

b) radio and television transmitters and receivers;

c) computer and other control equipment;

d) safety critical equipment, e.g., guarding of industrial equipment;

e) the health of the people around, e.g., the use of pacemakers and hearing aids;

f) equipment used for calibration or measurement

g) the immunity of other equipment in the environment. The user shall ensure that other equipment being used in the environment is compatible. This may require additional protection measures;

h) the time of day that welding or other activities are to be carried out.

Electromagnetic Compatibility (EMC)

The size of the surrounding area to be considered will depend on the structure of the building and other activities that are taking place. The surrounding area may extend beyond the boundaries of the premises.

Methods of Reducing Emissions

Mains Supply
Welding equipment should be connected to the mains supply according to the manufacturer's recommendations. If interference occurs, it may be necessary to take additional precautions such as filtering of the mains supply. Consideration should be given to shielding the supply cable of permanently installed welding equipment, in metallic conduit or equivalent. Shielding should be electrically continuous throughout its length. The shielding should be connected to the welding power source so that good electrical contact is maintained between the conduit and the welding power source enclosure.

Maintenance of the Welding Equipment
The welding equipment should be routinely maintained according to the manufacturer's recommendations. All access and service doors and covers should be closed and properly fastened when the welding equipment is in operation. The welding equipment should not be modified in any way except for those changes and adjustments covered in the manufacturers instructions. In particular, the spark gaps of arc striking and stabilizing devices should be adjusted and maintained according to the manufacturer's recommendations.

Welding Cables
The welding cables should be kept as short as possible and should be positioned close together, running at or close to floor level.

Equipotential Bonding
Bonding of all metallic components in the welding installation and adjacent to it should be considered. However, metallic components bonded to the work piece will increase the risk that the operator could receive a shock by touching these metallic components and the electrode at the same time. The operator should be insulated from all such bonded metallic components.

Earthing of the Workpiece
Where the workpiece is not bonded to earth for electrical safety, not connected to earth because of its size and position, e.g., ships hull or building steelwork, a connection bonding the workpiece to earth may reduce emissions in some, but not all instances. Care should be taken to prevent the earthing of the workpiece increasing the risk of injury to users, or damage to other electrical equipment. Where necessary, the connection of the workpiece to earth should be made by a direct connection to the workpiece, but in some countries where direct connection is not permitted, the bonding should be achieved by suitable capacitance, selected according to national regulations.

Screening and Shielding
Selective screening and shielding of other cables and equipment in the surrounding area may alleviate problems of interference. Screening of the entire welding installation may be considered for special applications. [1]

---

[1] Portions of the preceding text are contained in EN 60974-10: "Electromagnetic Compatibility (EMC) product standard for arc welding equipment."

- MASTER TABLE OF CONTENTS FOR ALL SECTIONS -

TABLE OF CONTENTS - PRODUCT OVERVIEW SECTION

Specifications

Specifications	
VOLTAGE	**INPUT AMPERES**
120VAC	5A

Rated Output at 140°F (40°C)	
DUTY CYCLE*	**AMPERES**
100%	600 AMPS 1100 AMPS (with water cooling)

Note:

*Duty Cycle is based upon the amount of welding performed in a 10 minute period.

Physical Dimensions (Overall Size and Weight Dependent Upon Configuration)				
MODEL	**HEIGHT**	**WIDTH**	**DEPTH**	**WEIGHT (as shipped)**
K227-1 K395-1	27.5 Inches (699mm)	33 Inches (838mm)	14 Inches (356mm)	120 Lbs. (54 kg) 130 Lbs. (59 kg)

Temperature Ranges	
OPERATING TEMPERATURE	**STORAGE TEMPERATURE**
-40 to 122°F (-40 to 50°C)	-40 to 185°F (-40 to 85°C)

SAW		
GEARING	**WIRE FEED SPEED Range**	**Wire Sizes**
90:1	50-400 ipm (1.3 - 5.1m/min)	3/32” - 3/16” (2.4 4.8mm)

Travel Speed Range
6 to 70 ipm (0.15 to 1.8 m/min)

PRODUCT SUMMARY

GENERAL PHYSICAL DESCRIPTION

The LT-7 Tractor is a self-propelled mechanized wire feeder, designed for the submerged arc process with track system capabilities. It is self-guiding and easy to operate – only one operator is usually required. It is designed to be used with a variety of Lincoln DC constant voltage and constant current power sources. The rugged, lightweight unit permits quick movement to the next joint. Its compact size fits through small openings and in to confined spaces. Butt and fillet welds can be made on heavy plate or steel as light as 12 gauge (2.5mm).The LT-7 Tractor is ideal for the following applications: ship and barge building, storage tank erection, bridge deck installation, beam, girder or column fabrication, and long seams on heavy weldments.

FEATURES

- LT-7 Tractor feeds 3/32 to 3/16” (2.4 to 4.8 mm) solid wires, from 35 - 400 inches per minute (0.9 - 10.2 m/min) wire feed speed.
- Calibrated tractor drive adjusts travel speeds from 6 to 70 inches per minute (0.12 to 1.8 m/min).
- Vertical head lift adjuster for adjusting electrical stickout from 1/2 in. to 5 in. (12.7 to 127.0 mm).
- Weld angle is up to 50° from vertical on either side; drag angle is up to 30° from vertical.
- Control box is conveniently located on the tractor (can be mounted either left or right), eliminating the need to return to the power source for routine procedure changes.
- Exceptional tracking control and self-steering in most applications leave the operator free for quality control, joint cleaning and flux handling.
- Capable of doing butt joints, horizontal fillets and lap joints to either the left or right side of the tractor frame.
- Close mechanical alignment between wire and joint maximizes weld quality with no fixturing costs.
- Three-year warranty on parts and labor.

Return to Section TOC
Return to Master TOC

Recommended Processes and Equipment

RECOMMENDED PROCESSES

- Submerged Arc (SAW) - DC+ or DC– up to 600 amps (1100 amps with water cooling).
- Tiny Twinarc®.

Process Limitations

- The LT-7 Tractor does not support open arc procedures.
- The LT-7 Tractor only supports one arc.

RECOMMENDED POWER SOURCES

- CV 655, DC 600, DC 655, DC 1000, DC 1500.

REQUIRED EQUIPMENT

Cables

K1822-25 - 25 Ft. (7.6m) Wire Feeder Control Cable

- Connects the LT-7 to power sources that have a 14 pin MS type connector (i.e.CV 655, DC 655 or DC 600)

K1797-25 - 25 Ft.(7.6m) Control cable extension

K1797-50 - 50 Ft.(15.2m) Control cable extension

- May be required for applications where the LT-7 is a long way from the power source, or for long weld applications. Extensions may be combined for a total of 200 ft. (60.8m).

K1842-10 - 10 ft. (3.0m)
K1842-35 - 35 ft. (10.6m) - Weld Power Cable - lug to lug, 3/0, 600A,60% duty cycle
K1842-60 - 60 ft. (18.2m)

K1842-110 - 110 ft. (33.5m) - Weld Power Cable - lug to lug, 4/0, 600A,60% duty cycle

K1798 - Adapter Cable

- For connecting to power sources with terminal strips and no 14 pin connector (i.e. DC 1000 od DC 1500).

K1798

Recommended Processes and Equipment (cont.)

REQUIRED EQUIPMENT (cont.)

Contact Nozzle Assemblies

K231-1 - Submerged arc nozzle kit includes all required items for feeding wire sizes from 3/32” to 3/16” (2.4-4.8mm).

K231

K148A - Positive Contact Nozzle for 3/32 or 1/8” (2.4-3.2mm) wires.

K148B - Positive Contact Nozzle for 5/32 to 3/16” (4.0.4.8mm) wires.

K148

K149-x/xx - Linc-Fill Attachments - Long stick-out guide for a K148 nozzle.

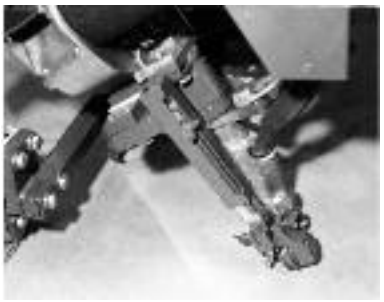
K149

Recommended Processes and Equipment (cont.)

RECOMMENDED GENERAL OPTIONS

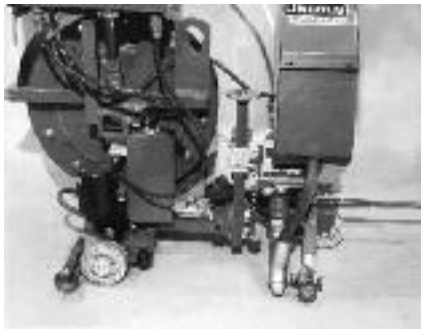
K232 - Horizontal Fillet and Lap Adapter Kit

- Includes a rear guide wheel, and a head tension spring and front guide wheel assembly on an adjustable arm which rides in the joint to maintain alignment and electrode angle.
- Kit includes separate front guide wheel assemblies for fillet and lap joints. Welds can be made to the left or right of the tractor's center line.



Right Side Fillets

Left Side Fillets

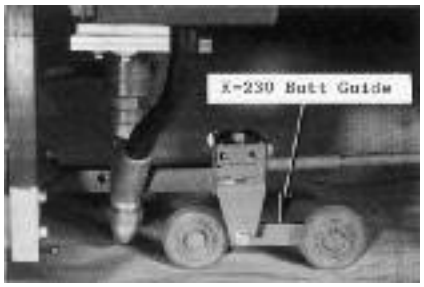


K229 - Flat Fillet Adapter Kit

- Includes front and rear guide wheels for operating the tractor in 30° or 45° flat fillet joints.

K230 - Butt Seam Guide Kit

- Mount in place of the standard front wheel to ride in a V-groove or open 1/8 - 3/8" (3.2 - 9.5 mm) butt joint, keeping the wire in required alignment.

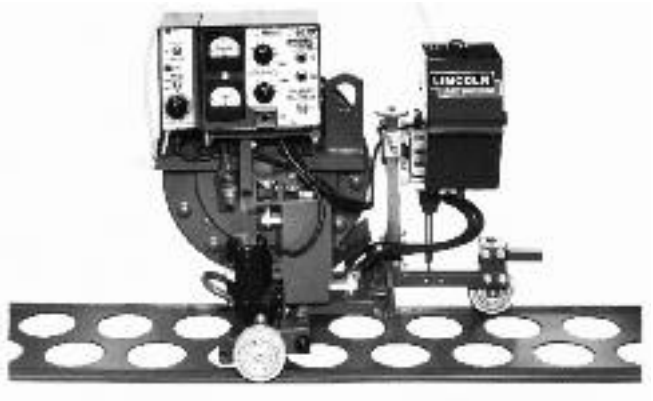


K400 - Track Conversion Kit

- Converts the LT-7 (K227-1) standard model for track guidance.

K396 - Track Section

- Provides 70 in. (1.8m) of travel. To be used with the K395-1or converted K227-1.



Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

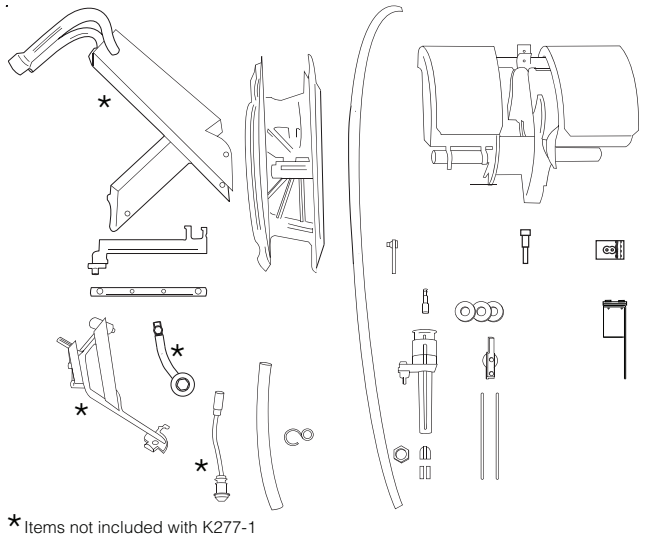
Recommended Processes and Equipment (cont.)

RECOMMENDED GENERAL OPTIONS

K277-1 - Tiny Twinarc Adapter Kit for Butt Seams

K227-2 - Tiny Twinarc Adapter Kit for Flat Fillets

- Converts the LT-7 standard models for Tiny Twinarc using 5/64" (2.0 mm) electrode. These kits may also be used for horizontal fillets with the addition of the K232 Adapter Kit.



*Items not included with K277-1
All items are included with K277-2

K285 - Concentric Flux Cone Assembly

- For use with the K148, Positive Contact Nozzle Assembly. Gives concentric flux coverage around the electrode.

K58 - Magnetic Flux Screen Separator

- Removes foreign magnetic particles from reused flux.

Return to Section TOC
Return to Master TOC

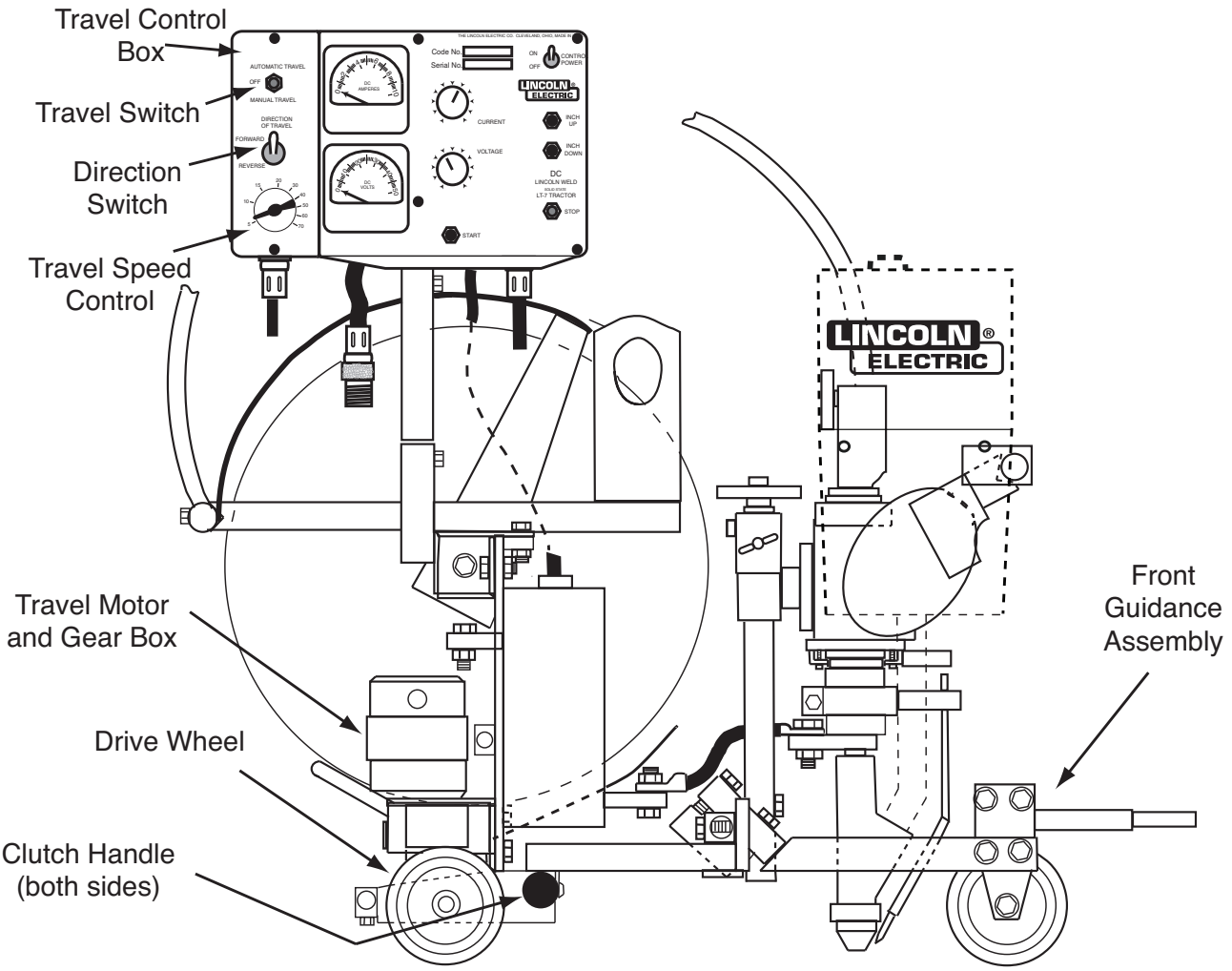
NOTES

TABLE OF CONTENTS - INITIAL SET UP SECTION

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

LT-7 Tractor Nomenclature

FIGURE B.1 - DRIVE COMPONENTS



TRACTOR DRIVE COMPONENTS

1. **Travel Control Box** - Contains the circuitry and controls to set travel direction and travel speed.

   Travel Switch - The “MANUAL” position is used for positioning. The “AUTOMATIC” position starts and stops the travel with the weld control switches. The “OFF” position prevents travel.

   Direction Switch - Determines the travel direction.

   Travel Speed Control - Used to set the desired travel speed.

2. **Travel Motor and Gear Box** - Provides for the movement of the LT-7 as directed by the Travel Controls.

3. **Drive Wheels** - Mounted on the rear axle which is gear driven by the Travel Motor.

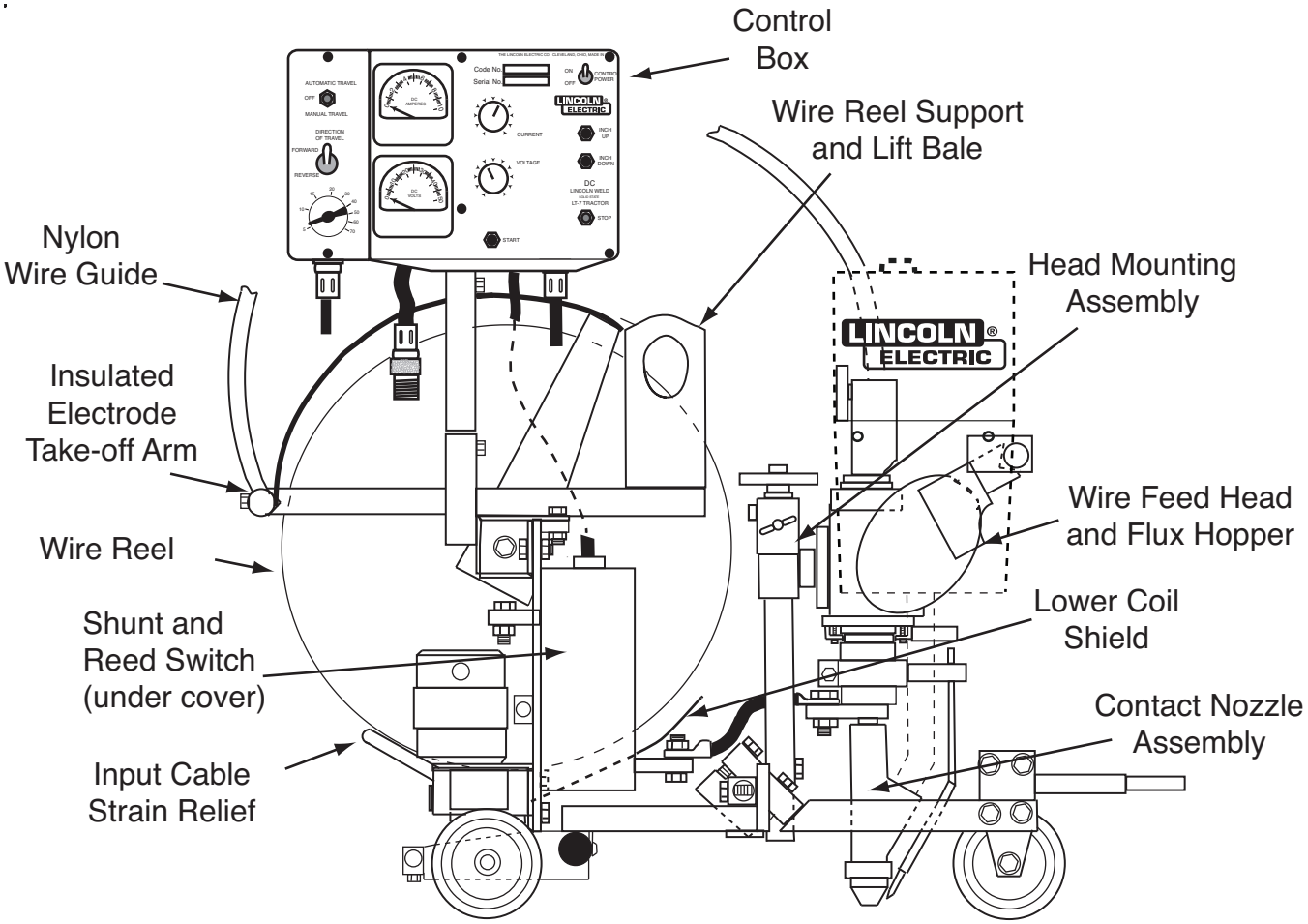
4. **Clutch Handle** - Engages or disengeges the drive gear on the rear axle to allow for normal drive or free-wheeling.

5. **Front Guidance Assembly** - Can be mounted in various positions to provide proper support, steering and tracking. See ***Figure B.4.***

Return to Section TOC
Return to Master TOC

LT-7 Tractor Nomenclature (cont.)

FIGURE B.2 - WIRE FEED AND CONTROL COMPONENTS



WIRE FEED AND CONTROL COMPONENTS

1. **Control Box** - Contains the circuitry, controls and meters for adjusting and monitoring of the weld parameters. See ***Figure B.3*** for more detailed information

2. **Wire Feed Head** - Drives the weld wire as directed by the Control Box. (See ***Figure B.5***).

3. **Head Mounting Assembly** - With the Vertical and Horizontal adjusters, allows for positioning of the Wire Feed Head. (See ***Figure B.7***).

4. **Flux Hopper** - Feeds flux to the nozzle at a rate determined by the Manual Flux Flow Valve. See ***Figure B.6.***

5. **Wire Reel** - Accepts standard 60# or 50# coils.

6. **Shunt** - Sends weld current information to the ammeter.

7. **Reed Switch** - Monitors the fact that weld current is present and relays that information to the Logic Board.

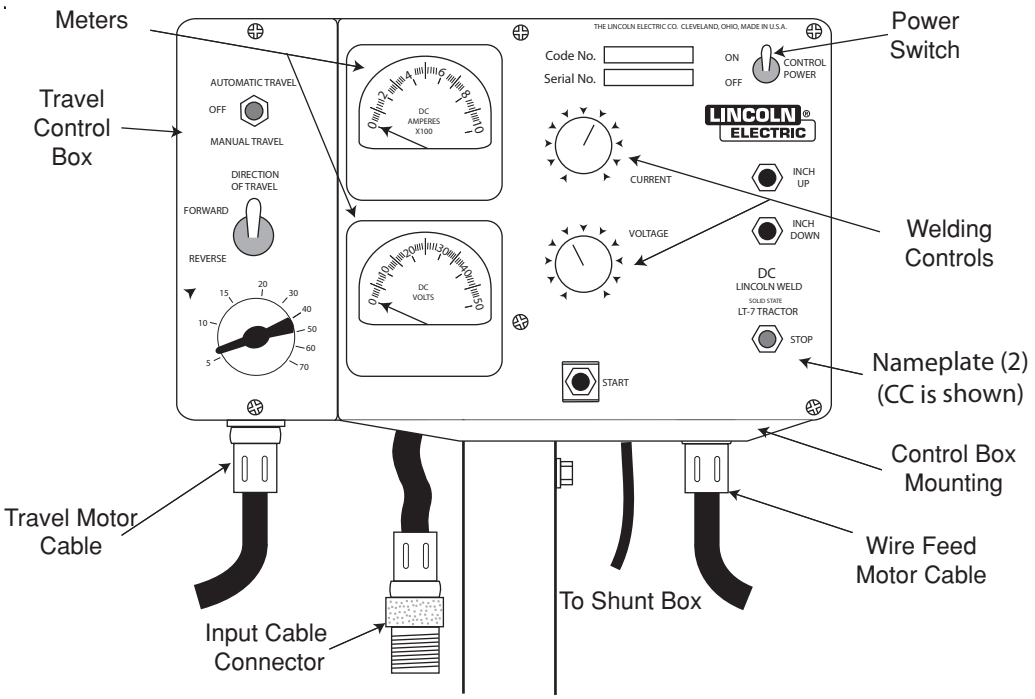
8. **Insulated Takeoff Arm** - Provides a path for the electrode through the Nylon Wire Guide to the Feed Head.

9. **Nylon Wire guide** - Prevents the electrode from touching any part of the LT-7 framework.

Return to Section TOC
Return to Master TOC

LT-7 Tractor Nomenclature

FIGURE B.3 - CONTROL BOX



1. **POWER SWITCH** - Controls 120vac input to the Control Box.

1. **AMMETER** - Shows 'actual' current while welding.

2. **VOLTMETER** - Shows 'actual' voltage (both OCV and weld volts) after the START button is pressed.

3. **INCH UP Button** - Provides "cold" wire retract.

4. **INCH DOWN Button** - Provides forward feed of wire through the feed head and Contact Nozzle.

⚠ CAUTION

DO NOT HOLD THE WELDING WIRE WITH BARE HANDS WHILE INCHING DOWN
When Inching Down, a low voltage signal is applied to the weld wire to enable the Auto Stop Circuit.

5. **START Button** - Initiates the weld and travel functions.

6. **STOP Button** - Stops the weld process and travel.

7. **Upper Welding Control** - Controls the output of the power source. In **CC Mode**, it controls the **Current** and in **CV Mode** it controls the **Voltage.**

8. **Lower Welding Control** - Controls the Wire feed Speed. In **CC Mode** it controls the **Voltage** and in **CV Mode** it controls the **Current**.

9. **Nameplate** - There are two (2) nameplates provided. The CC (VV) Operation is shown in Figure B.3, The CV nameplate is mounted behind the VV nameplate

   NOTE: The CV nameplate labels the upper control as VOLTAGE, and the lower control as CURRENT (See ***Figure E.6***). The functions of the controls are as indicated above.

10. **Input Cable Connector** - accepts the control cable from the power source.

Return to Section TOC
Return to Master TOC

LT-7 Tractor Nomenclature (cont.)

FRONT GUIDANCE ASSEMBLY

1. **Clamp Arm** - Mounts to the Cross Beam to support the Front Wheel Asssembly. See Figure B.4.

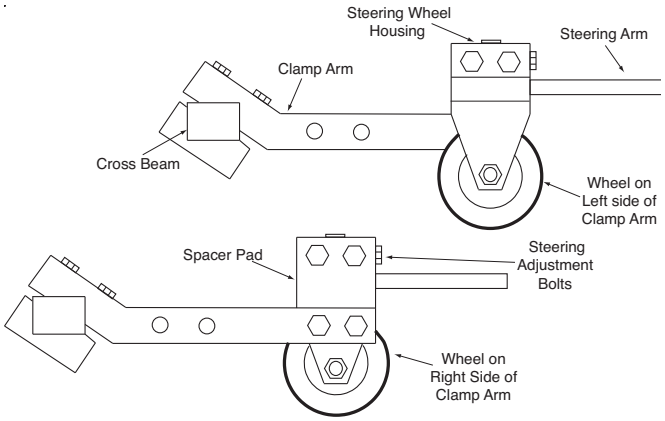
2. **Steering Wheel Housing** - Provides the pivot mechanism and adjustments for the front Wheel.

3. **Spacer Pad** - Mounts the Front Wheel Assembly to the Clamp Arm. Either set of holes can be used and the wheel can be mounted on either side of the Clamp Arm as shown in Figure B.4.

4. **Steering Adjustment Bolts** - Used to set tracking in a straight line or a fixed curve. See ***Steering Methods*** in Section C of this manual.

5. **Steering Arm** - Used to make minor adjustments while welding. See ***Steering Methods*** in Section C of this manual.

FIGURE B.4



WIRE FEED HEAD COMPONENTS

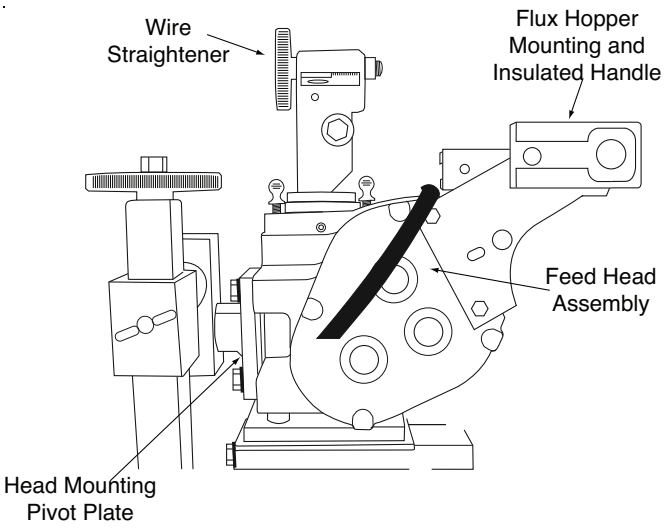
1. **Feed Head Assembly** - Wire feed motor, gearbox and wire drive mechanism for feeding 3/32" through 3/16" electrode.

2. **Wire Straightener** - Helps remove excessive 'cast' and 'helix' from the wire as it feeds through the system.

3. **Head Mounting Pivot Plate** - Mounts the Feed Head to the Cross Seam Assembly. It permits angular adjustment to change the weld angle.

4. **Flux Hopper Mounting** - Provides two mounting positions (one on each side) for the Flux Hopper. It also is an insulated handle that can be used for manual positioning of the LT-7.

FIGURE B.5



Return to Section TOC
Return to Master TOC

LT-7 Tractor Nomenclature (cont.)

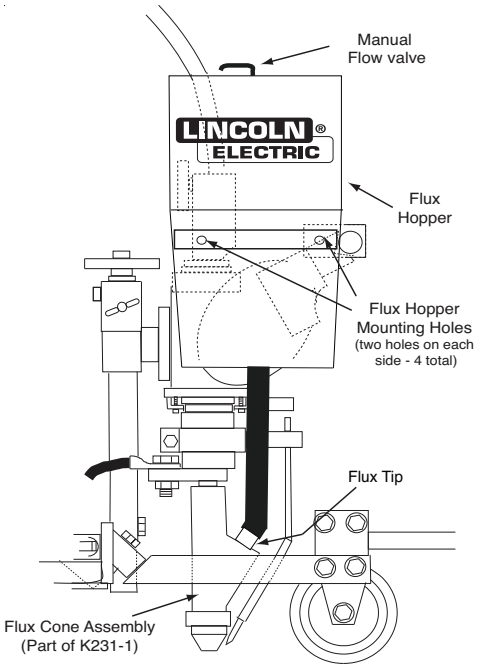
FLUX HOPPER ASSEMBLY

1. **Flux Hopper** - Holds 15 lbs.(6.8 kg) of welding flux.

2. **Manual Flow Valve** - Controls the amount of flux through the flux tube to the contact nozzle.

4. **Flux Hopper Mounting Holes** - Four 5/16-18 tapped holes (two on each side) allow for various mounting options of the Flux Hopper depending on the weld application being used.

FIGURE B.6



HEAD MOUNTING AND ADJUSTING

1. **Mast** - Provides support for and vertical adjustment of the Wire Feed Head. It can be mounted vertically as shown or repositioned to 30° or 45° for fillet welds.

2. **Vertical Adjust** - Provides fine adjustment for proper electrical stickout.

3. **Cross Seam Assembly** - Holds the Feed Head and allows for horizontal movement to align the weld wire in the joint.

4. **Locking Screw** - Permits coarse vertical positioning of the Feed Head.

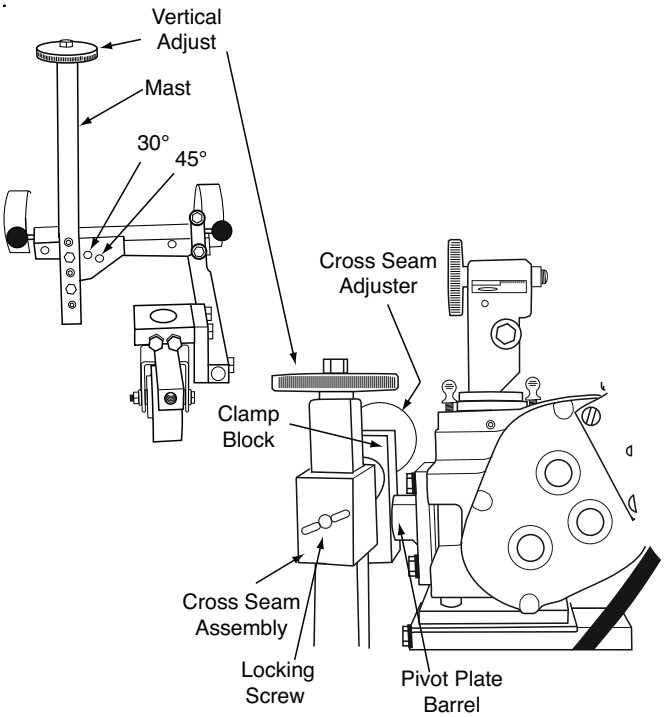
NOTE: Older Codes had a either a hex head bolt or a "T" Locking Screw. Codes before 7948 had no Vertical Adjust as shipped from the factory.

5. **Clamp Block** - Provides coarse cross seam adjustment as well as drag angle and weld angle adjustment. It can be mounted as shown or so the Pivot Plate Barrel is above the Cross Seam Assembly. See ***Figure C.8.***

6. **Pivot Plate Barrel** - Mounts the Feed Head to the Clamp Block. It allows the head to be rotated to change the electrode angle.

7. **Cross Seam Adjuster** - Provides fine horizontal adjustment for proper electrode placement.

FIGURE B.7



Return to Section TOC
Return to Master TOC

TABLE OF CONTENTS - ASSEMBLY SECTION

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

GENERAL INFORMATION

The LT-7 is shipped assembled (except for the installation of the contact nozzle assembly) ready to feed 3/32" (2.4 mm) through 3/16" (4.8 mm) diameter electrode. Install the contact nozzle assembly (ordered separately) per instructions as appropriate.

Items shipped loose that may or may not be required for a particular weld application are:

S15287 - Pointer Assembly with clamp for K231-1 Contact Nozzle

S15682-2 - Pointer Clamp for K148 Contact Nozzle

T13835 - Flux Tube and Tip Assembly

S15184 - Control Box Extension (with hardware)

S15294 - Flux Tip for use with K148

This section will aid in setting up the LT-7 Tractor with various Contact Nozzle Assemblies and optional kits for performing different weld applications (butt welds, fillet welds and lap welds). It will also cover methods of steering and 'tracking'.

It may be more convenient to do the mechanical set-up for the particular application before connecting the control and welding cables.

Tools Required

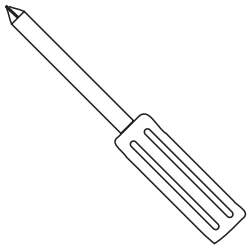
The following tools will be required to set up the LT-7 Tractor

7/16-inch (Preferred) or
11 mm Combination Wrench

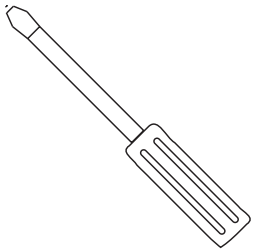
1/2-inch (Preferred) or
13 mm Combination Wrench

9/16-inch (Preferred) or
15 mm Combination Wrench

3/4-inch (Preferred) or
19 mm Combination Wrench



#2 Phillips
Screwdriver



Flat Blade
Screwdriver

⚠ CAUTION

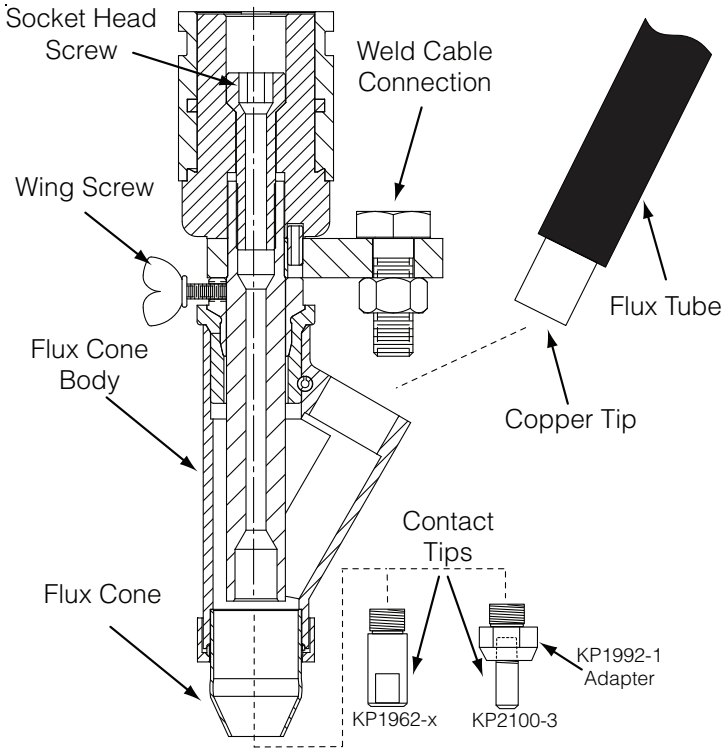
All Hardware is “English”. If using Metric tools, be careful not to “round off” the corners of the hardware.

Some items will require two wrenches to tighten properly.

Sockets and a ratchet can be used to access most of the hex head hardware items.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

FIGURE C.1 - K231-1 CONTACT NOZZLE ASSEMBLY



K231-1 CONTACT NOZZLE

Use the K231-1 for submerged arc welding using currents generally under 600 amps. Higher currents can be used but result in somewhat faster tip wear.

The outer flux cone deposits flux around the arc for full coverage with minimum flux consumption.

Contact tips for 3/32" (2.4mm) through 5/32" (4.0mm) are shipped with each nozzle. Tips for 3/16" (4.8mm) are also available. A different contact tip is required for each electrode diameter used.

NOTE: In other systems, K231 nozzles used for 3/32" (2.4 mm) electrode use a liner and a contact tip adapter.

DO NOT USE THE LINER WITH THE LT-7.

Screw the adapter into the end of the nozzle and the contact tip into the adapter. (See Figure C.1).

INSTALLATION

Insert the outgoing wire guide from the wire feed head into the top of the nozzle and install the nozzle in position on the bottom of the wire feed head. Lock it in position using the two clamps provided with the head.

Connect the end of the Flux Tube assembly to the bottom of the flux hopper. Fit the copper tip into the hole in the flux cone body. See Figure C.1

⚠ CAUTION

Do not push the copper tip fully into the flux cone body. It may cause an electrical short between the cone and nozzle if the cone touches the work.

Connect the lug of the electrode cable from the tractor shunt box to the tab on the contact nozzle and tighten the bolt and nut.

OPERATION - DO NOT completely straighten the electrode. A slight curvature is required in the electrode to insure good electrical contact inside the contact tip.

MAINTENANCE - Replace the contact tip when it no longer provides accurate wire location or good electrical contact. Rusty and dirty wire or excessively high currents increase tip wear. Always keep replacement tips in stock.

To replace the contact tip, first loosen the retaining wing nut and remove the flux cone. Then unscrew the tip and replace it.

A special socket head screw holds the nozzle body to the insulator. If the nozzle body becomes loose, remove the nozzle from the head, tighten the screw and reassemble nozzle.

FIGURE C.2. - K148 CONTACT NOZZLE ASSEMBLY

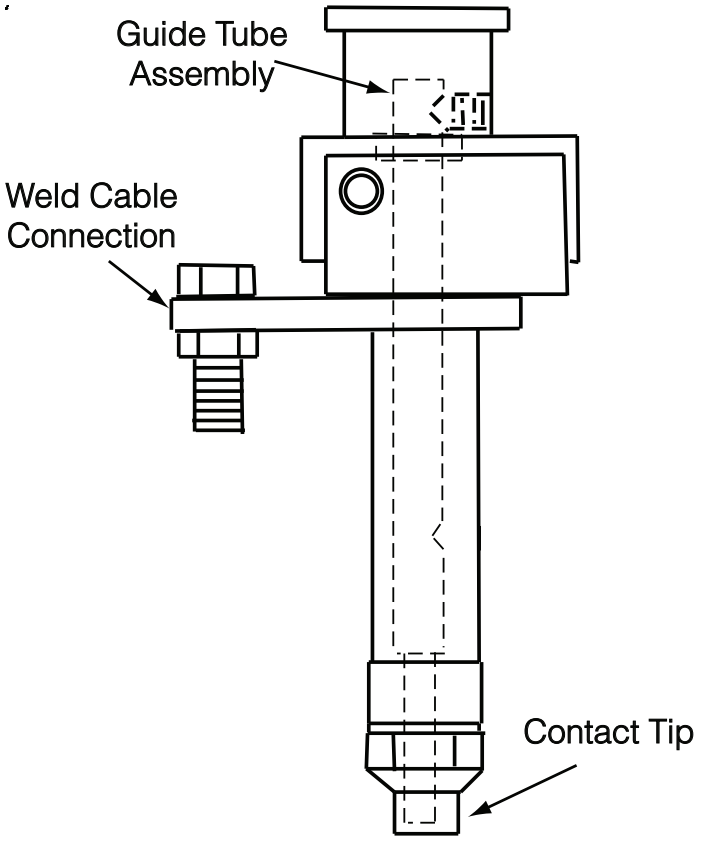
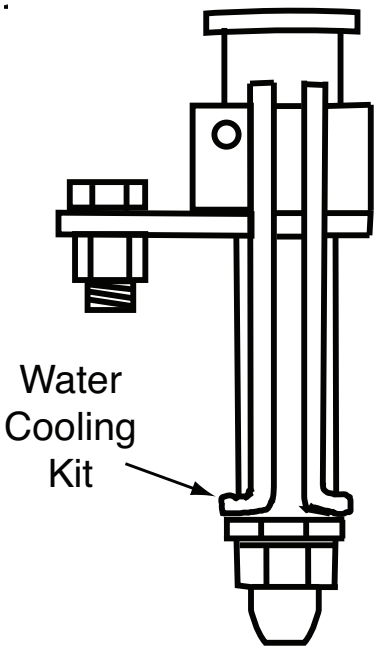
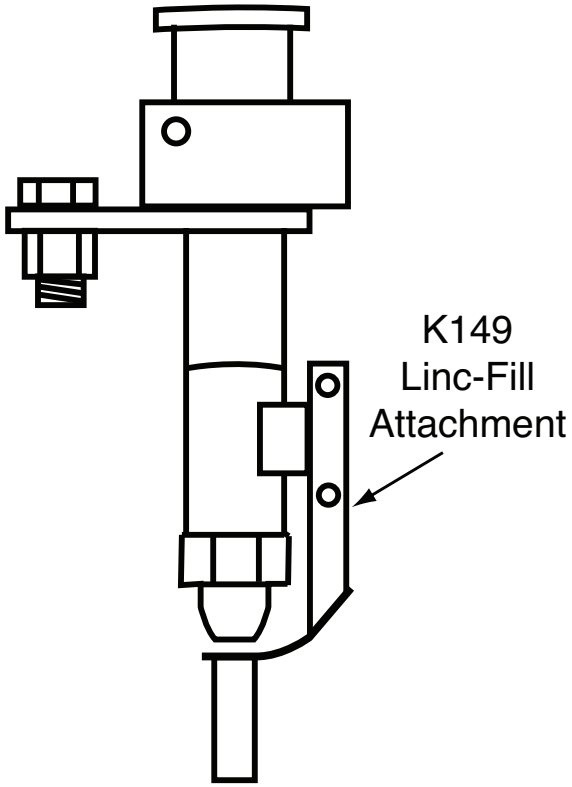


FIGURE C.2.a - WATER COOLING AND K149 LINC-FILL™ ATTACHMENTS



K148 With Water Cooling Attachment



K148 & K149

K148 CONTACT NOZZLE

Although designed primarily for the Innershield® process, this nozzle can be used with the with the LT-7 for higher current and/or long stick-out submerged arc applications. Water cooling can be added for longer tip life and the K149 Linc-Fill kit allows for longer stickout applications.The two models recommended for use with the LT-7 are:

K148-A	3/32”(2.4mm) and 1/8”(3.2mm) wires
K148-B	5/32”(4.0mm) and 3/16”(4.8mm) wires

Current Ratings

A. Without Linc-Fill Attachment

Innershield Welding:
600 amps, 100% duty, no water cooling
1100 amps, 100% duty, with water cooling

Submerged arc welding:
1100 amps, 100% duty, no water cooling

B. With K149 Linc-Fill Attachment

Innershield or Submerged Arc Welding:
1100 amps, 100% duty, no water cooling

Water Cooling Attachment

When using currents over 600 amperes at high duty cycles water cooling always increases contact tip life. The cooling attachment is ordered as a seperate item. Order part Number T12928. Installation instructions are included in the kit.

K148 INSTALLATION

To install the nozzle on the head, insert the outgoing wire guide from the head into the nozzle assembly. Place the combined assembly in position on the bottom of the Wire Feed Head. Clamp it in place using the two clamps supplied with the head.

Before pulling the clamps up tight the nozzle must be positioned relative to the travel direction as shown in Figure C.3. This position is recommended so that accidental contact between the work and the nozzle will not compress the contact pressure spring. If positioned otherwise, such accidental contact may cause arcing inside the contact tip

After the nozzle is positioned properly with respect to the travel direction, the connector tab for the electrode cables can be moved to any of four positions 90 degrees apart. To change the tab, remove the two 1/4-20 hex head screws. Tap the connector tab to loosen it from the tapered collar on the nozzle body. Turn the tab to the desired position. Replace and tighten the 1/4-20 screws. See Figure C.3.

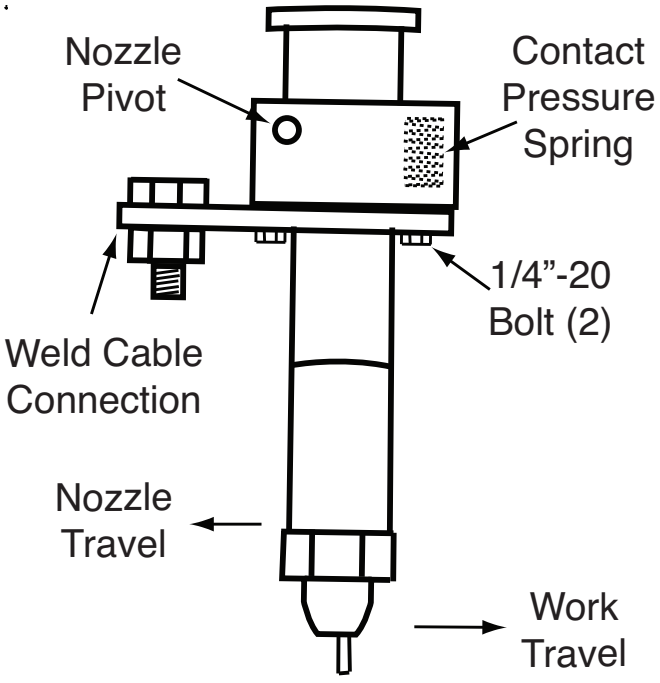
The same contact tip, S13763, is used for 3/32” (2.4 mm) through 3/16” (4.8 mm) diameter electrodes. S16388 is used for .062 (1.6 mm) and 5/64 (2.0 mm) electrode.

Straighten the start end of the coil for at least eight inches, pass the end down through the appropriate wire straightener. Inch the wire through the wire feeder and the nozzle.

K148 Contact Tip Wear and Replacement

Because the electrode is held against one point of the contact tip, it wears a groove at that point. When the groove is about one half the diameter or the electrode, rotate the contact tip to a new position per the instructions below. Careful positioning of the contact tip will provide four to six wear spots depending upon the electrode size. See ***Figure C.4a***.

FIGURE C.3



When welding with the small diameter electrodes, it will be necessary to change contact position more frequently since the amount of tip wear that can be tolerated is much less.

The tang of the wire guide should never be allowed to touch the I.D. of the contact tip. If the groove is allowed to wear until the tang touches the contact tip, welding current will pass through the tang causing electrical wear and overheating of both the tang and the contact tip. See Figure C.4.a.

To rotate the tip:

1. Clip the end of the electrode and inch it up until it is free of the contact tip.

2. Loosen the locking nut about one-half turn and push against the nozzle body to relieve the pressure of the tang against the inside of the contact tip hole. See Figure C.4.

3 With the pressure alleviated, rotate the tip to get a new surface and then retighten the locking nut.

To install a new contact tip:

1. Clip the end of the electrode and inch it up until it is free of the tip.

2. Remove the contact tip locking nut.

3. Relieve the spring pressure of the steel tang in the hole of the contact tip. To do this, push the nozzle body so the steel tang is approximately centered in the 3/8" (9.5 mm) hole in the contact tip. Under these conditions the contact tip can be easily removed from the nozzle body. See Figure C.4.

4 a. Before installing the new tip, make sure the threads and the bottom surface of the nozzle are clean and bright. These surfaces are current carrying areas and must be clean.

b. Push on the nozzle body to relieve the pressure and insert the new contact tip.

5. a. Check the locking ring threads making sure they are free or any foreign material. A small application of high temperature anti-seize compound on these threads will insure a longer thread life of the two mating parts.

b. Replace the locking ring and tighten securely.

6. Check the contact tip to be certain it is tight in the nozzle body. If not, arcing will take place between the tip and the nozzle body which will damage the nozzle body.

FIGURE C.4 - TIP REPLACEMENT

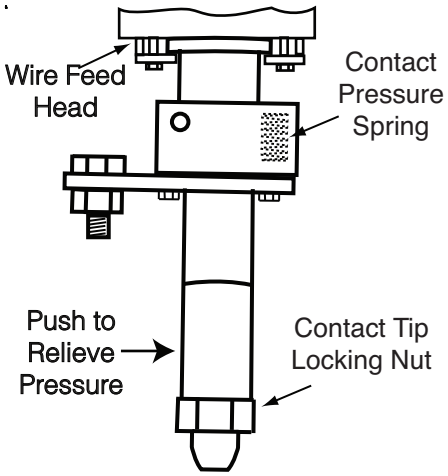
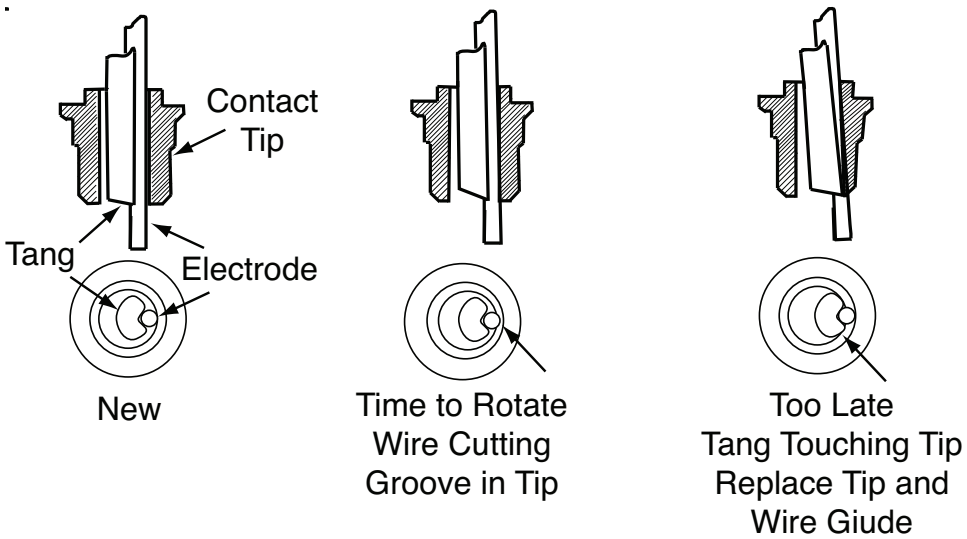


FIGURE C.4.a - CONTACT TIP WEAR



K149 LINC-FILL™ LONG STICK-OUT EXTENSION

1. Install the K149 attachment before mounting the K148 nozzle on the welder.

2. Place a small C-clamp on the spring supporting members (A) and (B) in such a manner that the spring can be compressed. (See Figure C.5) Look up the hole in the end of contact tip and tighten the C-clamp until the backup tang lifts off the surface of the contact tip.

3. Remove the 3/8" (9.5 mm) set screw (C) from the nozzle body (A).

4. Remove the contact tip clamping nut (D) and the contact tip.

5. Remove the brass thread protecting collar (E).

6. Remove the window cover (F) from unit.

7. Slide the center guide (G) up out of the pivot body until the tang is above the window.

8. Place the Linc-Fill guide assembly into the nozzle window, and then lower the center guide tube (G) back down to its original position.

9. Line up the spot at the top of the center guide tube (G) with the 3/8" (9.5 mm) tapped hole in the upper pivot block (A) and put the 3/8" (9.5 mm) set screw (C) back into the hole and tighten securely.

10. Line up the lower spot in the center guide tube (G) with the 3/8" (9.5 mm) set screw (H) and tighten this screw securely.

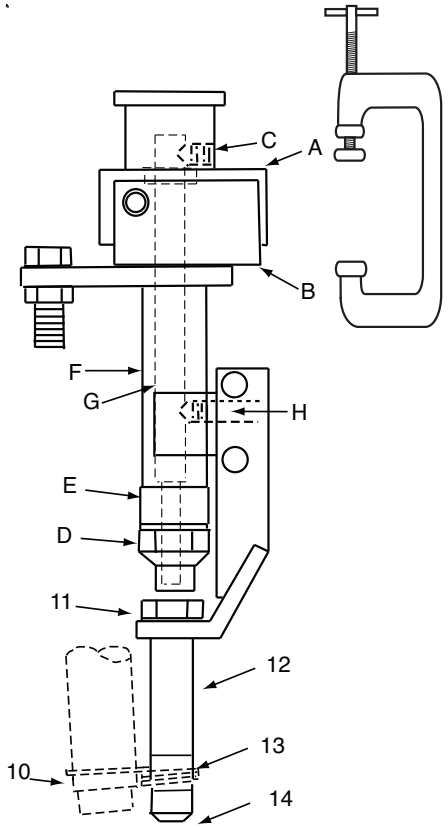
11. Replace the brass thread protecting collar (E). It is important that this protecting collar be pulled up against its locating shoulder, otherwise the tip locking nut will not clamp the tip securely.

12. Replace the contact tip and its clamping nut (D) and tighten securely.

13. Assemble the proper combination of extension guides (Items 12, 13 and 14) with locking nut (Item 11) for the welding procedure to be used.

14. If Submerged Arc welding is being used, screw the flux hose clamp (Item 13) onto the extension housing. Insert the hose from the flux hopper (Item 10) into the flux hose clamp.

FIGURE C.5

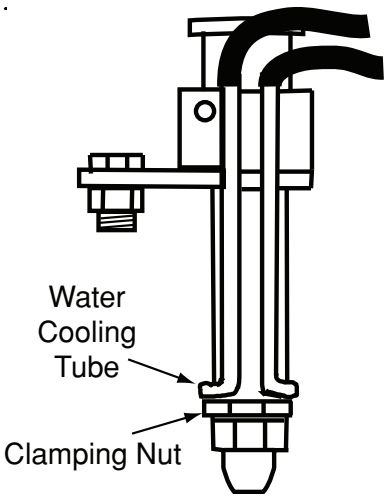


WATER COOLING ATTACHMENT

When using currents over 600 amperes at high duty cycles water cooling always increases contact tip life. The cooling attachment is ordered as a seperate item, Part No. T12928. Installation instructions are included in the kit.

Connect the attachment to the water supply and the drain with rubber tubing obtained locally. Water flow should be between 1/2 - 1 gallon (1.9 - 3.8L) of tap water per minute. (See Figure C.6)

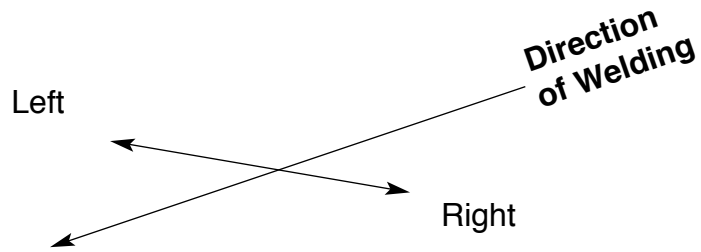
FIGURE C.6



MECHANICAL SETUP FOR VARIOUS TYPES OF WELDS

Before attempting to reset the tractor for a specific type of joint, review the illustration below.

Left and Right throughout these instructions refers to left or right when facing the tractor as it comes toward you as illustrated.



SET UP FOR BUTT WELDS

Depending upon the joint design, welding procedures and clearance available on both sides of the joint, decide:

1. Whether to make “right” or “left” butt welds. Right side butt welds can be up to 5.62” (143mm) to the right of the LT-7 centerline and left side welds can be from 4.0” (102mm) to 9.62” (244.3mm) to the left of the centerline. See Figure C.7.

2. The amount of electrical stickout required by the procedures.

3. Which steering method (self-steering, K230 Butt Guide or track guiding) is best.

4. Whether the pointer assembly or control box extension are needed.

Then arrange the head mounting and guidance system as appropriate per the following instructions.

RIGHT OR LEFT BUTT WELDS AND SHORT OR LONG STICKOUT

Mount the cross seam adjuster on the mast to the right of the mast for right butt welds or to the left for left butt welds.

Position the clamp block below the cross seam adjuster for standard short stickout procedures. Position it above the adjuster for Linc-Fill™ long stickout procedures using the K148 nozzle and K149 extension assembly. See Figure C.8

NOTE: When making a right butt weld the clamping block should be clamped on the cross seam assembly in a position so the electrode will not be in line with the shield protecting the drive gear on the rear axle.

FIGURE C.7

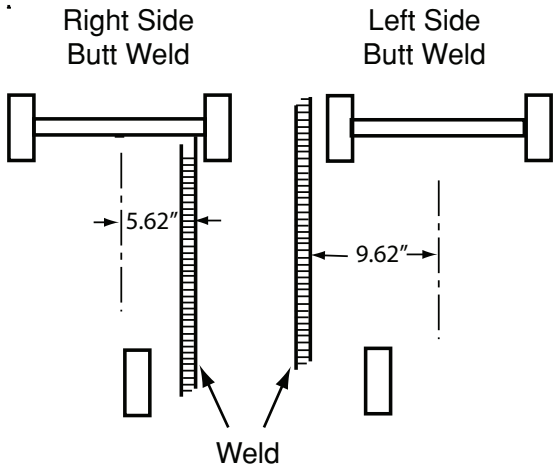
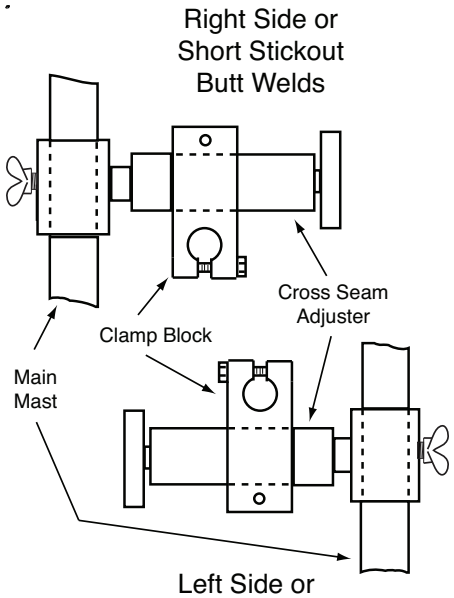


FIGURE C.8



FRONT VIEW

MECHANICAL SETUP FOR VARIOUS TYPES OF WELDS (CONT.)

STEERING METHODS

There are various guiding methods for the LT-7:

1. **The Self-Steering Method -** Using the standard front guidance assembly is satisfactory for most multiple-pass and single-pass butt joints without a gap. When properly set the tractor follows a straight seam with only occasional corrections by the operator. The pointer assembly should be installed. (See Figure C.10). The Clamp Arm can be positioned as needed and the Steering wheel can be placed on either side of the Clamp Arm as required. (See ***Figure C.5***).

The standard front guidance system can be set for automatic tracking in a straight line or fixed curve using the two bolts above the wheel. See Figure C.9.

a. To turn further left, loosen the right bolt and tighten the left bolt.

b. To turn further right, loosen the left bolt and tighten the right.

c. When the tracking is set, but sure both bolts are snug.

To manually adjust the tracking while welding, simply push the steering lever in the desired direction momentarily and let it snap back into its preset position. An extension arm shipped with each tractor can be screwed into the steering arm when desired.

Pointer Assembly - The Pointer can be used to help insure that the weld is following properly in the joint, especially when using the Self Steering Method of tracking.

a. Position the clamp around the nozzle insulator so the pointer is in line with the electrode and tighten the clamp. Use the 2" (50.8 mm) ID clamp on the K231 nozzle or the 1-1/2" (38.1 mm) ID clamp with the K148 nozzle.

b. Loosen the wing screw and position the pointer tip over the joint, close to but not touching the work. Tighten the screw.

FIGURE C.9

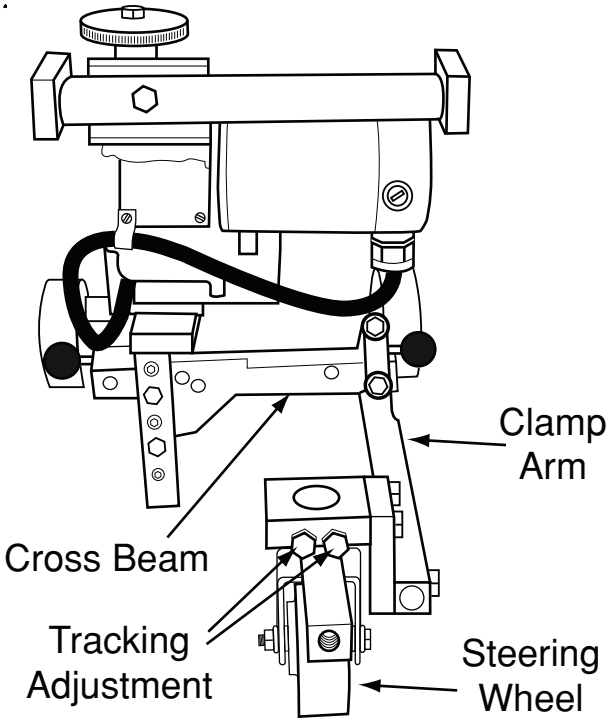
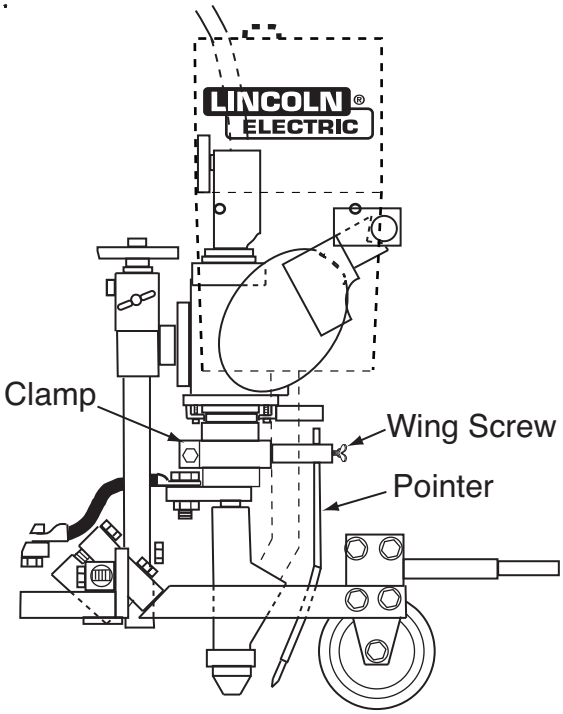


FIGURE C.10



Return to Section TOC
Return to Master TOC

MECHANICAL SETUP FOR VARIOUS TYPES OF WELDS (CONT.)

STEERING METHODS (CONT.)

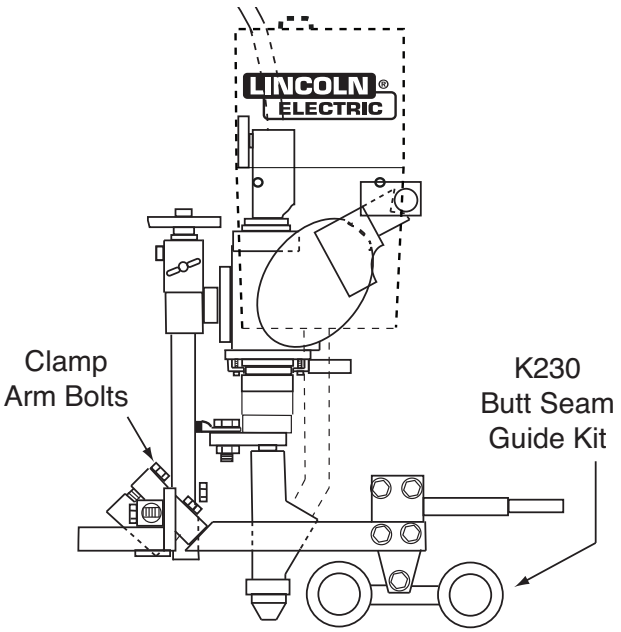
2. **Optional K230 Butt Guide -** provides positive tracking for single pass V-groove and square edge butt welds with a gap of about 1/16" (1.6 mm) to 1/4" (6.4 mm) wide. Install as follows:

   a. Remove the standard front wheel.

   b. Using the sleeve, axle bolt and nut from the standard Steering Wheel assembly, mount the K232 Butt Guide Wheel Assembly with the axle bolt above the guide wheel shafts as shown in Figure C.11. Do not overtighten the axle bolt.

   c. Loosen the bolts holding the clamp arm and slide the clamp arm over the cross beam to position the guide wheels in the seam.

FIGURE C.11

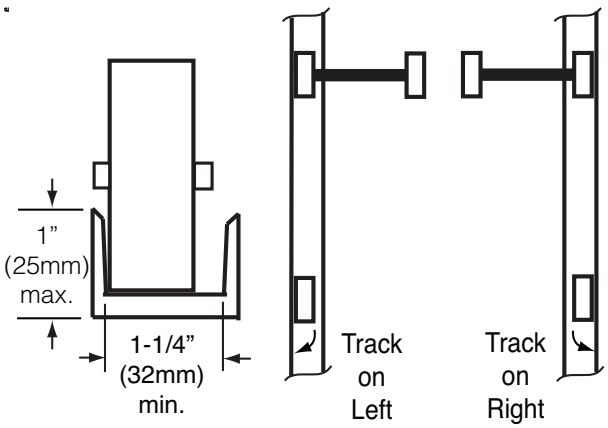


3. **Channel Tracking -** with a user provided straight channel of appropriate length and a minimum 1-1/4" (31.8 mm) web and maximum 1" (25.4 mm) flange:

   a. Line the front wheel up with either the right or left rear wheel, as appropriate, so the front and one drive wheel ride in the channel. (See Figure C.12).

   b. Set the Tracking Adjustment Bolts to keep the front wheel "toed" slightly against the side of the channel. (See ***Figure C.9***).

FIGURE C.12

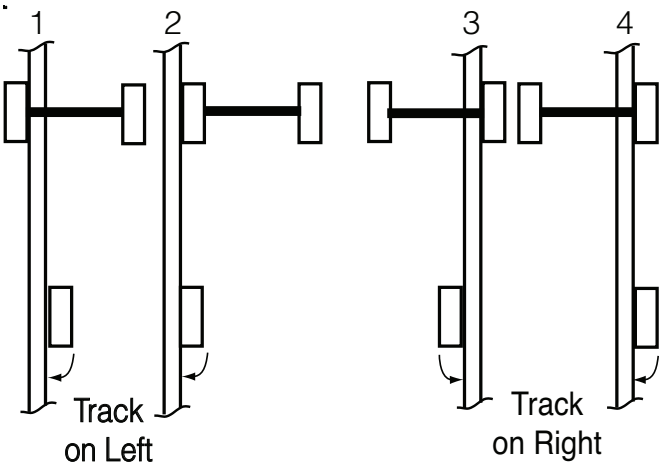


4. **Bar Tracking -** with a user provided straight bar 1/2" (12.7 mm) to 1" (25.4 mm) thick by 1-1/4" (31.8 mm) wide:

   a. Set the tractor so the front wheel and the drive wheel are in contact with the bar. There are four possible arrangements as shown in the sketches. (See Figure C.13).

   b. Set the Tracking Adjustment Bolts to keep the front wheel "toed" slightly against the bar. (See ***Figure C.9***).

FIGURE C.13



Return to Section TOC
Return to Master TOC

SET UP FOR HORIZONTAL FILLET WELDS

The **K232 Fillet -Lap Guide Kit** is recommended for horizontal fillet welding but with proper tracking or with the "Track Model" LT-7 (See ***K395 or K400 information***), these welds can be made by adjusting the Clamp Block, Cross Seam Adjustment, Vertical Adjustment and Feed Head rotation as needed for proper alignment.

Depending upon the welding procedures and clearances around the joint, decide:

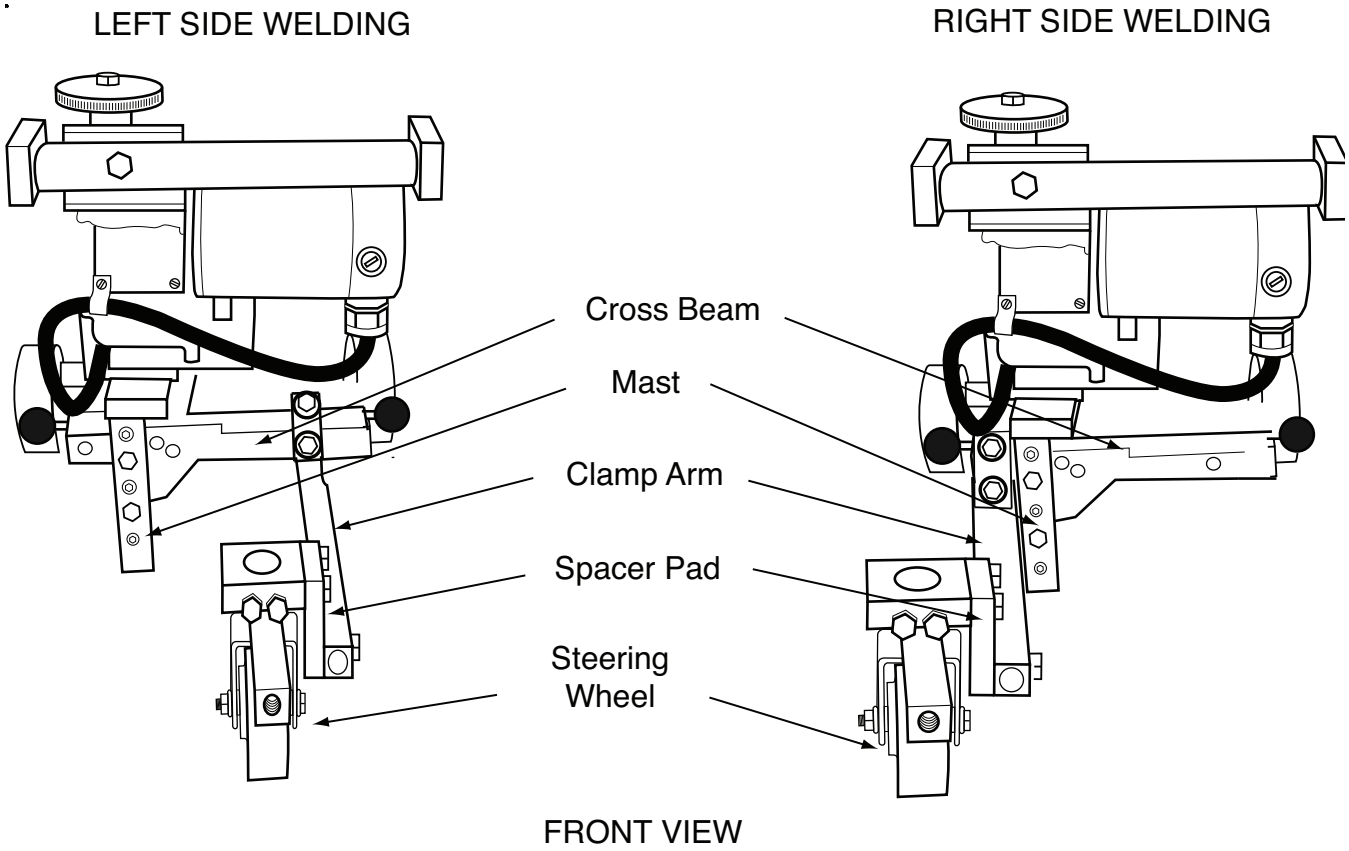
1. Whether to weld to the left side or right side of the tractor.
2. What electrical stickout is required by the procedures.
3. Which steering method is best if not using a "Track Model". See ***Steering Methods***.

Rearrange the head mounting and guidance system as appropriate per the following instructions:

FRONT GUIDANCE ASSEMBLY

1. Mount mast to the cross beam. See Figure C.14.
2. Mount the cross beam extending to the right of the mast using the center and right mounting holes.
3. Mount the spacer pad and steer wheel housing to the left side of the clamp arm. See Figure C.14.
4. If welding to the left side of the tractor, mount the clamp arm to the right end of the cross beam 3" (76.2 mm) from the end of the cross beam. If welding to the right side, mount the clamp arm to the left end of the cross beam next to the mast .

FIGURE C.14 - GUIDANCE FOR HORIZONTAL FILLET



SET UP FOR HORIZONTAL FILLET WELDS (CONT.)

HEAD MOUNTING

1. Mount the cross seam assembly on the mast near the top so it extends to the right. Move the clamp block as close to the mast as possible. Turn the cross seam adjuster hand wheel for full left position (i.e. completely closed).

2. Position the clamp block with the head mounting hole below the cross seam barrel. Install the head. Rotate the clamp block so the nozzle is 90º to the joint. Tighten the clamp. See Figure C.15.

NOTE: The Clamp Block can be rotated above the Cross Seam adjuster for long stickout applications. (See ***Figure C.8***).

3. Rotate the head pivot plate barrel to position the head to the left or right as desired with the proper weld angle – usually 40° from horizontal. The 40° left or right positions are easily set by aligning the grooves in the pivot plate barrel with the groove in the clamp block . Tighten the clamp.

NOTE: For left side fillets the mast can be repositioned to the 45° position if desired See Figure C.15.

4. Install either a K148 nozzle or a K231 nozzle . If using Linc-Fill long stickout procedures, first install the K149 extension and the parts for the desired stickout on the K148 nozzle.

5. Install the reel take-off tube to prevent contact with the electrically “hot” electrode. Insert the nylon tube into the take-off arm coupling. Thread the electrode thru the tube and thru the wire straightener to the drive rolls. Inch the electrode down thru the nozzle.

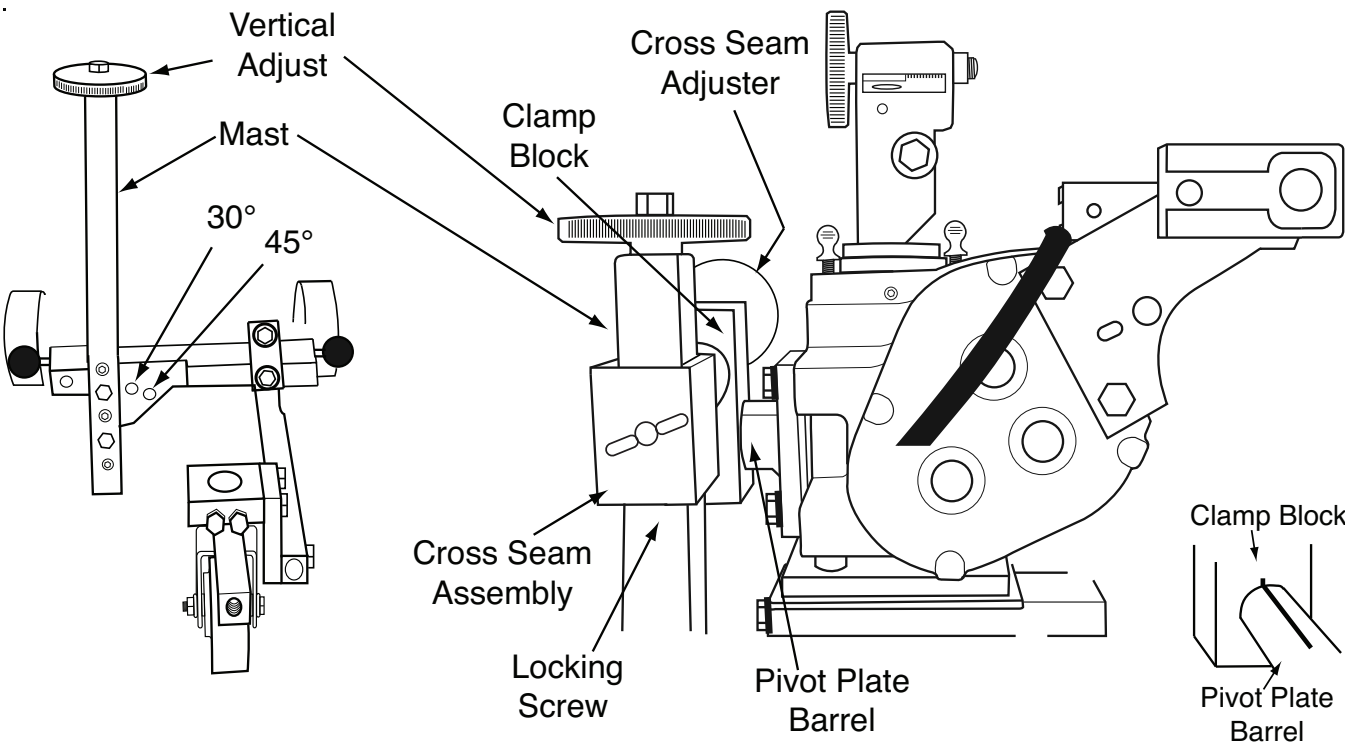
6. While inching the electrode out of the nozzle, adjust the straightener for properly straightened wire. Cut the wire off and set the electrode stickout as specified in the procedure.

7. If the control box must face to the right over the reel for left fillets, remove the control box from the standard mounting socket and add the Control Box Extension that is included with the LT-7.

NOTE: The control box interferes with the reel take-off tube if the extension is used for right side fillets.

8. Mount the Flux Hopper using the mounting hole that provides the best positioning for proper flow.

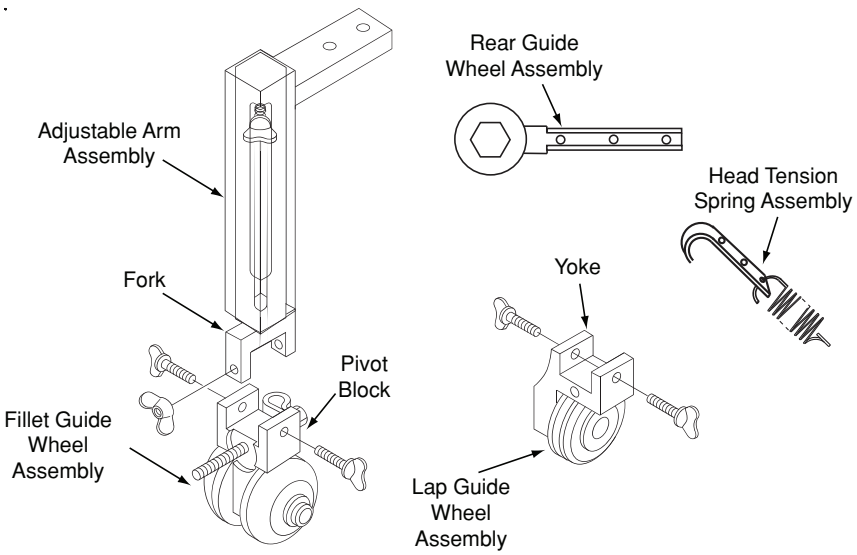
FIGURE C.15 - HEAD MOUNTING FOR HORIZONTAL FILLET

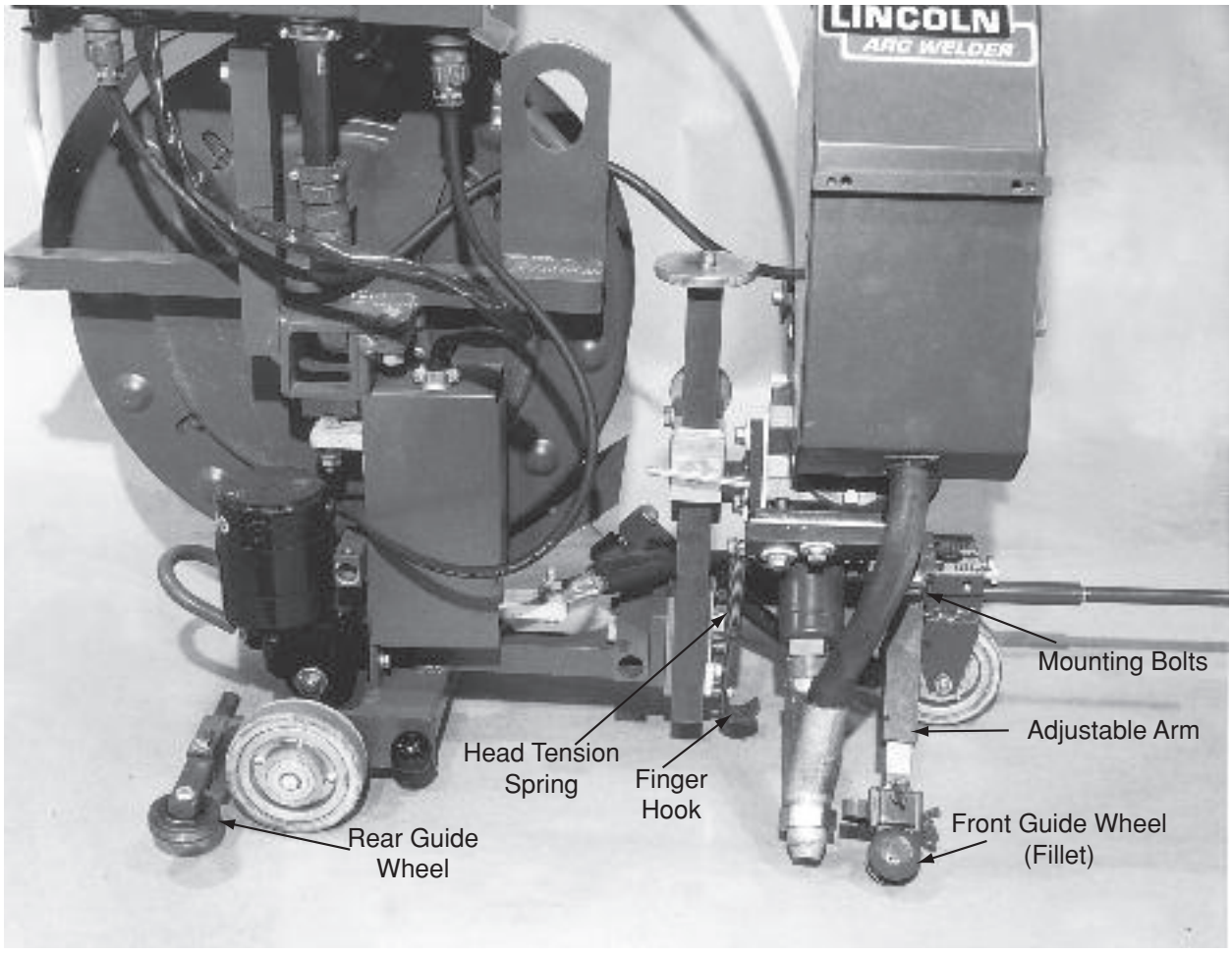


SET UP FOR HORIZONTAL FILLET WELDS (CONT.)

The **K232 FILLET-LAP GUIDE KIT** is designed to provide precise positioning of the welding electrode into the fillet or lap joint. It consists of the following items and associated hardware:

1. Adjustable Arm Assembly
2. Front Guide Wheel Assemblies (Fillet and Lap)
3. Head Tension Spring Assembly
4. Rear Guide Wheel Assembly





SET UP FOR HORIZONTAL FILLET WELDS (CONT.)

K232 INSTALLATION

1. Mount the adjustable arm to the head directly in front of the nozzle using the two bolts and washers provided. (**Be sure the arm is square with its mounting**.) Lock the slide in the full up position.

2. The front guide wheels are assembled to the fork at the end of the adjustable arm. Be sure the flux hose loop extends to the left for left side fillets and to the right for right side fillets.

NOTE: If not using the Flux Cone Body of a K231 nozzle, use this loop to hold the flux hose.

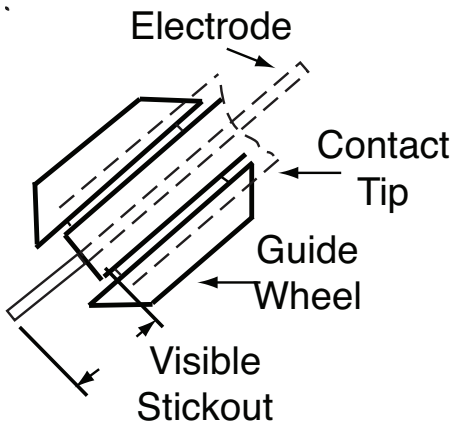
3. Install the rear guide wheel into the socket behind the rear drive wheel with the guide wheel above the arm. Use the socket by the left rear wheel for left side fillets and vice versa. Use the three tapped holes in the guide wheel arm and the two holes of the socket to adjust for stickout dimensions from 3/4" (19.1 mm) to 5" (127 mm) E.S.O.

ALIGNMENT IN THE JOINT

1. Set the electrode stickout as specified in the procedures. Place the tractor with the end of the electrode almost touching the vertical plate and the rear guide wheel against the vertical plate.

2. Slightly loosen the cross seam assembly lock bolt. Lower the head assembly down the mast and position the front of the tractor until the tip of the electrode is properly positioned in the joint per Figure C.16. Tighten the lock bolt.

FIGURE C.16

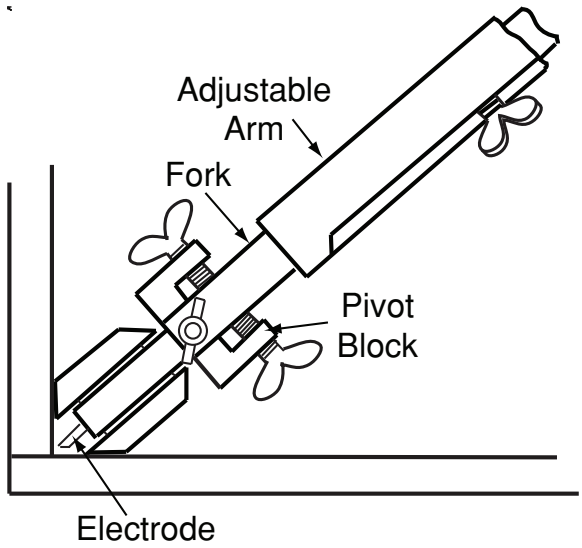


3. Loosen the thumb screw on the adjustable arm. Lower the guide wheels to the joint and adjust the pivot block thumb screws until the wheel assembly rides properly in the joint as shown in the Figure C.17. Tighten the thumb screw.

4. Loosen the cross seam assembly lock bolt allowing the pivot plate barrel to be free to rotate. Install the head tension spring assembly shipped with the K232 kit. Place the loop on the spring over the cap screw on the head and place a hole in the finger hook over the cap screw at the bottom of the mast. Use the farthest hole from the end of the finger hook for right side fillet and the closer hole for left side fillets.

5. Lift the end of the nozzle so the pivot plate barrel rotates beyond the 40º position and tighten the lock bolt. Then loosen the lock bolt just enough to permit the tension spring to pull the head down to its proper welding position.

FIGURE C.17



6. Install the flux hopper on the right side of the bumper handle for right side fillets or vice versa. Use the bracket on the sloping surface of the hopper.

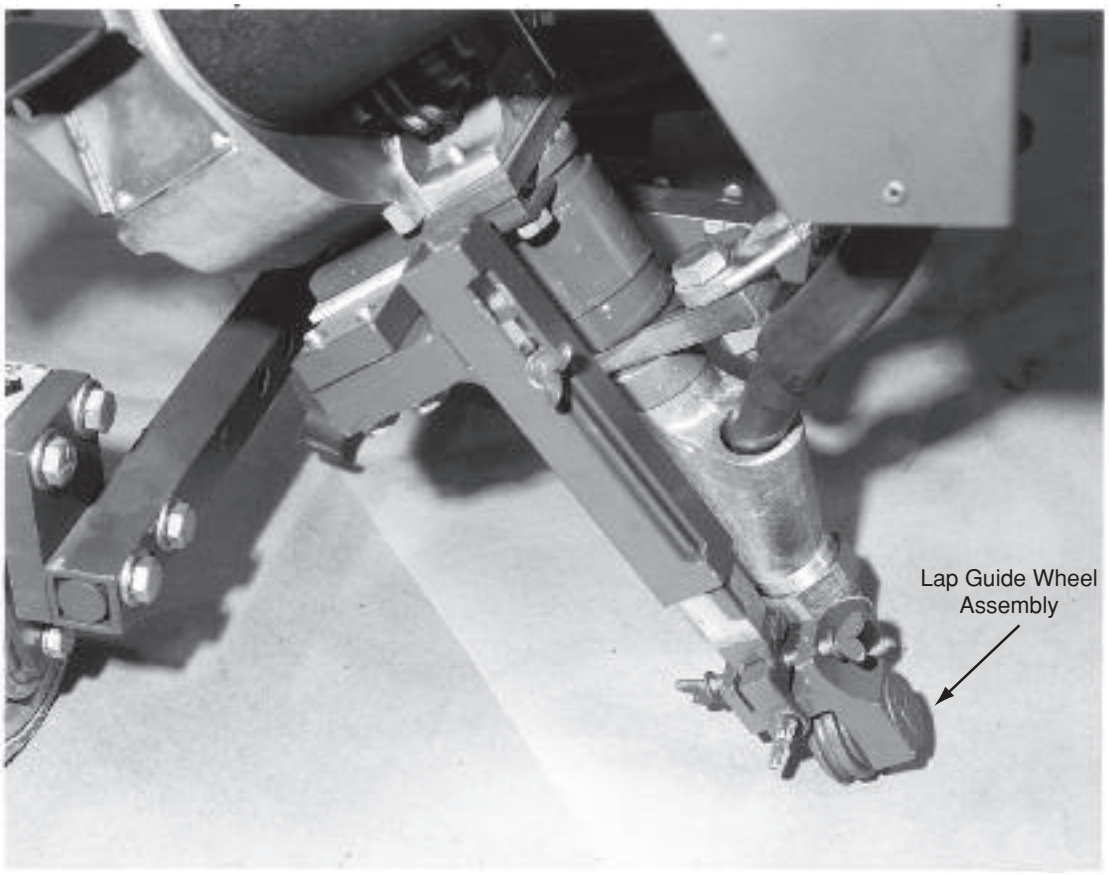
7. If using a K148 nozzle (or a K231 without a flux cone) insert the copper tube in the end of the flux hose thru the loop behind the front guide wheel and position the tube so the chamfer is about parallel to and 3/16" (4.8 mm) from the vertical plate. Lock this position by tightening the wing nut. Be sure the tube does not interfere with the wheel.

8. Check the position of the electrode in the joint and adjust as necessary by using the two thumb screws which position the pivot block of the guide wheels. Loosen one and tighten the other until the electrode location is proper, then tighten both screws. The weld angle should remain close to 40°.

9. Set the steering adjustment bolts to toe-in 2° to 5° into the joint. See ***Figure C.9***. The opposing action of the steering and spring-loaded guide wheels will maintain positive alignment along the joint while welding.

SET UP FOR LAP WELDS

FIGURE C.18 - K232 LAP GUIDE



SET UP FOR LAP WELDING

Set the tractor for left and right lap welding using the same equipment and instructions used for horizontal fillet welding except:

1. Replace the fillet guide wheel and yoke of the K232 kit with the lap welding guide wheel and yoke.

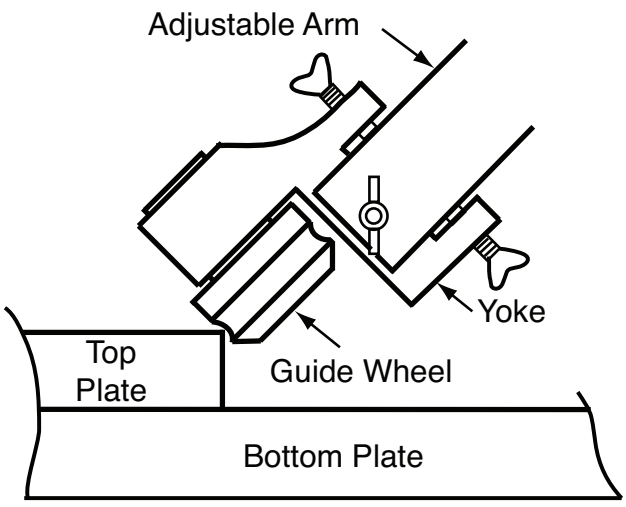
2. Mount the yoke on the adjustable arm with the wheel on the right side for left laps and vice versa.

3. The guide wheel rides on the corner of the top plate of the lap joint.

4. Do not use the rear guide wheel of the K232 kit. Set the rear wheel the proper distance from the joint for the desired stickout – about 2” (50.8 mm) for 3/4" (19.1 mm) to 1” (25.4 mm) stickout.

5. Set the steering adjustment bolts to toe-in 2° to 5° into the joint. See ***Figure C.9***. The opposing action of the steering and spring-loading guide wheels will maintain positive alignment along the joint while welding.

FIGURE C.19



Left Side Lap Weld

SET UP FOR FLAT FILLET WELDS

The **K229 FLAT FILLET KIT** is required for making flat fillet welds. It consists of the following items and associated hardware:

Reel Adapter Bracket
Rear Support Assembly
Front Support assembly

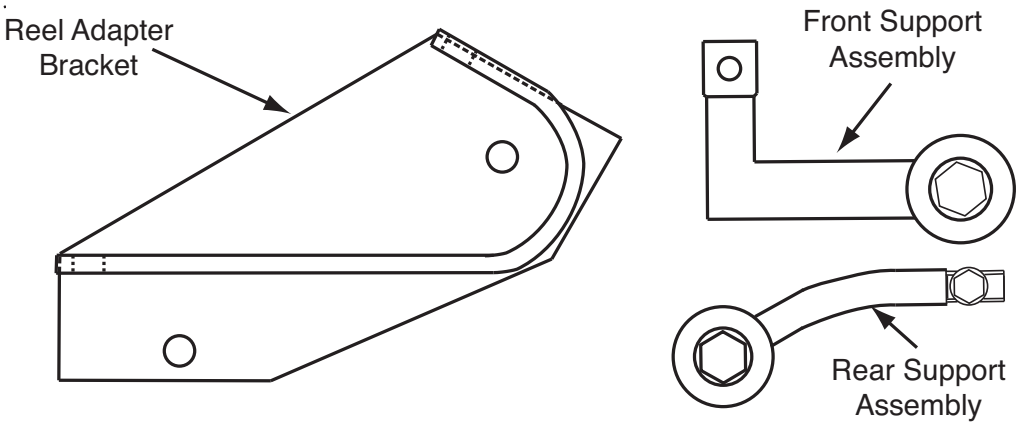
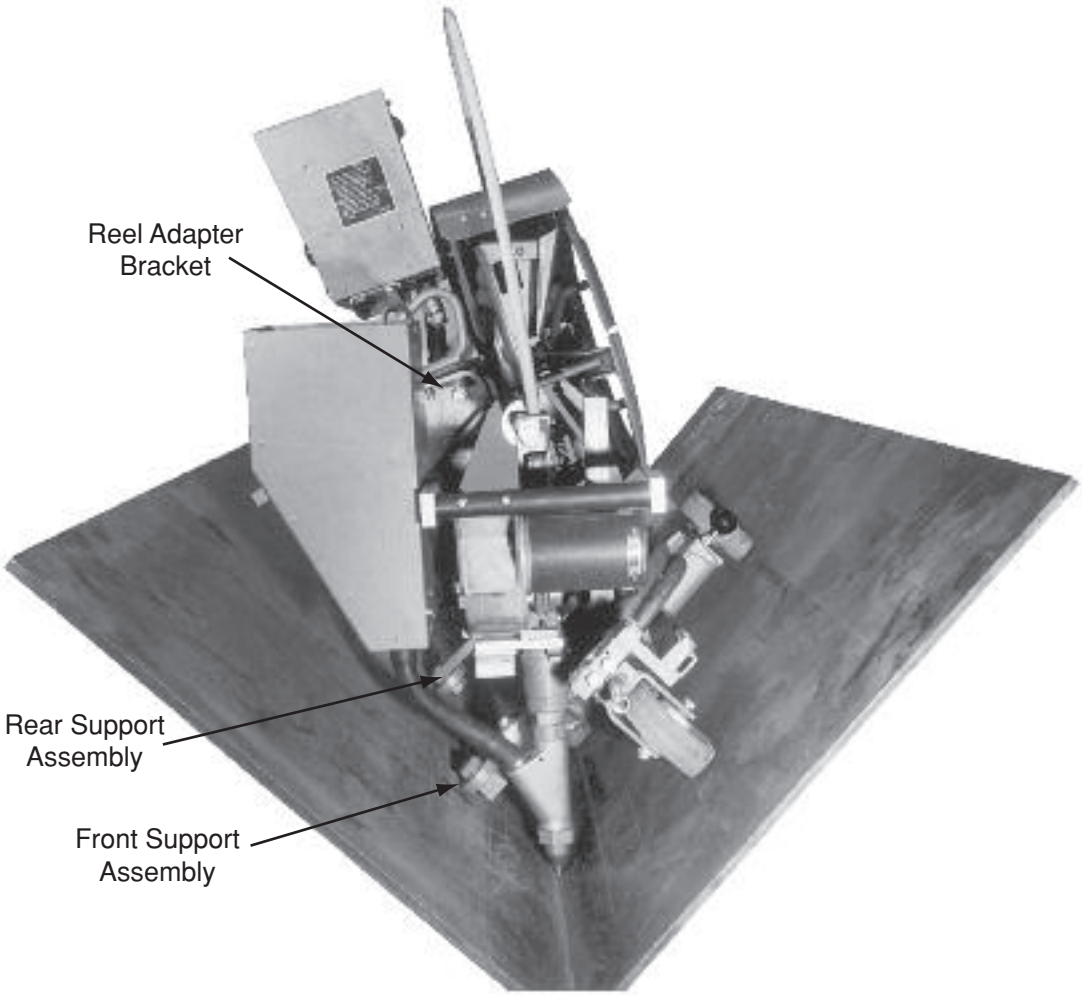


FIGURE C.20 - K229 FLAT FILLET KIT INSTALLED



SET UP FOR FLAT FILLET WELDS (CONT.)

K229 INSTALLATION

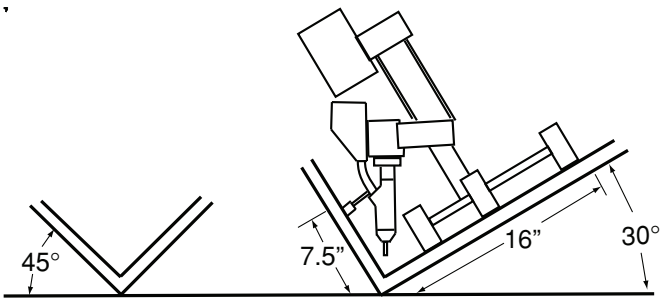
Before installing the K229 and depending upon the procedures and the weldment and clearances, decide:

1. Whether to position the plates at a 45^0 or 30^0 angle from horizontal. When positioned at 30^0 the tractor must ride on the more horizontal plate. The vertical plate must be a minimum of 7.50" (190.5 mm) min. and the horizontal plate a minimum of 16" (406.4 mm). See Figure C.21.

2. What electrical stickout is desired.

Then arrange the guidance system and head mounting per the following instructions:

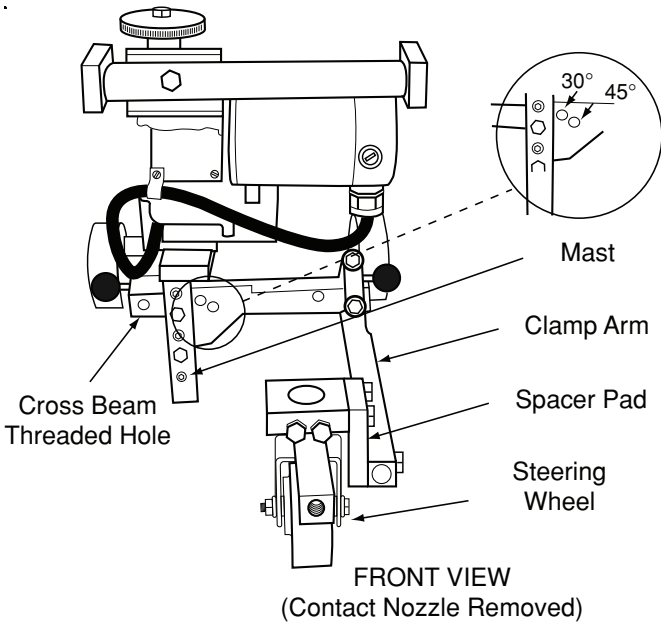
FIGURE C.21



FRONT GUIDANCE ASSEMBLY

1. Find the two tapped holes on the end of the cross beam . Position the cross beam at the mast so these tapped holes are to the left of the mast with one facing to the rear and the other up. Mount the cross beam to the mast using the center and left mounting holes.
2. Install the front support wheel from the K229 kit so the left end of the cross beam using the two tapped holes so the wheel extends forward.
3. Mount the clamp arm with the front wheel installed to the short right extension of the cross beam.

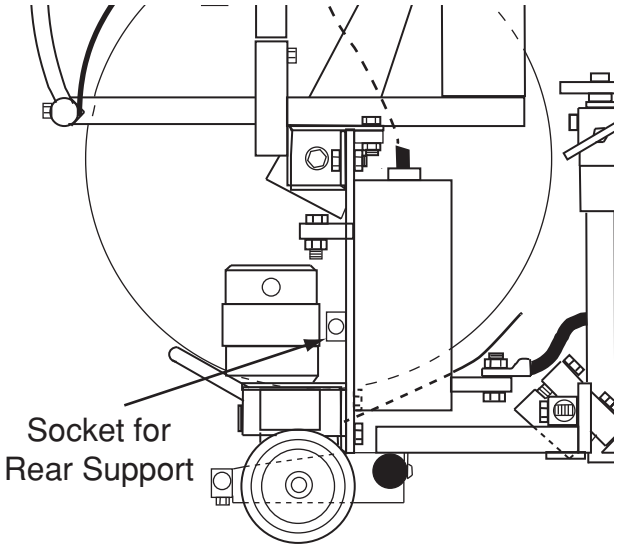
FIGURE C.22



REAR SUPPORT WHEEL

Insert the rear support wheel from the K229 kit into the mating socket located just in front of the tractor drive motor.

FIGURE C.23

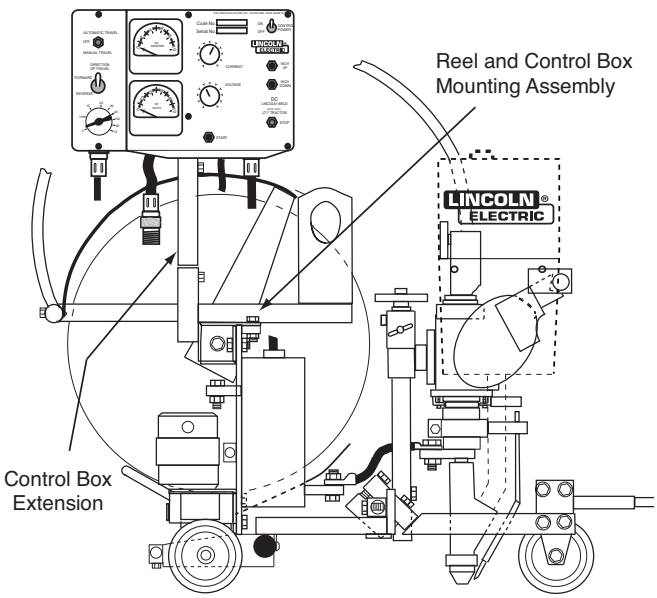


SET UP FOR FLAT FILLET WELDS (CONT.)

REEL AND CONTROL BOX MOUNTING

1. Remove the reel from the tractor.
2. Remove the reel and control box mounting assembly from the tractor frame by removing the two screws. See Figure C.24.
3. Install the angular extension from the K229 kit to the tractor frame using the reel and control box mounting assembly holes.
4. Install the reel and control box mounting assembly to the end of the angular extension.
5. If the control box is difficult to reach or must face to the right over the wire reel, remove the control box from the standard mounting socket. Insert the stud end of the extension tube that came with the LT-7 into the mounting socket and mount the control box on the extension.

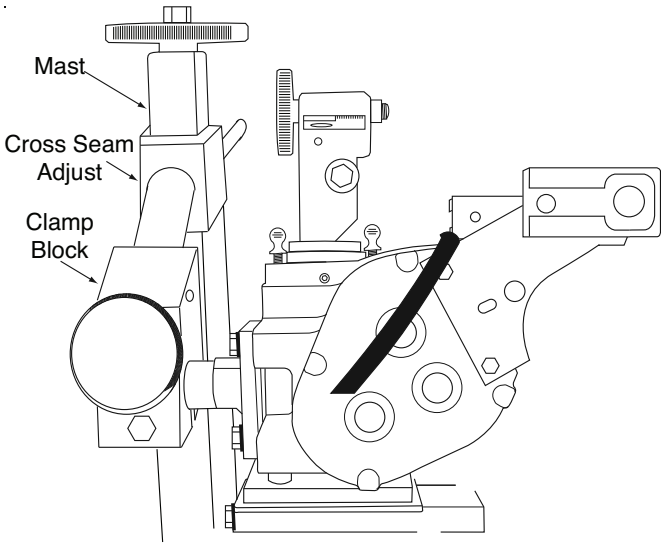
FIGURE C.24



HEAD MOUNTING

1. Install the mast leaning to the right using the lower pivot hole and the upper hole for 45° or 30° fillets as appropriate. See ***Figure C.22***.
2. Mount the cross seam assembly on the mast extending to the left side. See Figure C.25.
3. Position the clamp block with the head mounting hole below the cross seam barrel. Install the head. Rotate the clamp block to set the desired drag angle – usually 90° to the joint.

FIGURE C.25



4. Mount the flux hopper to the flux hopper mounting using the bracket on the vertical surface of the hopper. For 30° fillet, install the hopper to the left side of the bumper handle. For 45° fillets, the flux hopper can be installed on either side but the right side provides better tracking stability.
5. Install the K231 or K148 nozzle. If using the Linc-Fill long stickout procedures, first install the K149 extension and parts needed for the desired stickout onto the K148 nozzle. Move the cross seam assembly up or down the mast to set the stickout.

ALIGNMENT IN THE JOINT

1. Tighten all mounting and locking bolts and nuts.
2. Set the tractor in the joint with the tractor wheels on one plate and the two K229 kit support wheels on the other. See ***Figure C.20***.
3. Set the steering mechanism to steer straight or turn slightly to the left.
4. Line the electrode up with the joint using the cross seam adjuster.

K395 TRACK MODEL LT-7

The **K395 TRACK MODEL LT-7**, or standard K227 LT-7 with the **K400 TRACK CONVERSION KIT** installed, is equipped for use on **K396 TRACK SECTIONS**. Either version permits complete use of the off-track versatility and capability of the standard K227 LT-7.

The Track model provides precise track guidance and positive traction for single submerged arc or Tiny Twinarc® welding of butt or horizontal fillet / lap joints using standard LT-7 accessories or kits (refer to appropriate sections of this manual.)

The Track Model LT-7 provides the following features that are not included on the standard K227 LT-7 Tractor:

A. Three combination wheel assemblies.

- One side of each wheel assembly is the same as those used on the standard LT-7 to permit normal “off-track” traveling.
- Two of the wheel assemblies have a hardened steel grooved wheel to precisely guide on the Track rail. The front rail wheel assembly has nylon bushings and the rear rail wheel assembly does not.
- The third wheel assembly has a hardened steel spur gear to provide positive travel traction on the Track gear rack.

B. A Mast Pad Extension Arm assembly (longer than the standard Cross Beam Assembly).

C. A longer nozzle weld cable, to extend the location of the head outside the right or left sides of the tractor.

D. A Travel Control Box nameplate with dual Travel speed scales.

- The inside scale is calibrated for “on-track” Travel Speeds.
- The outside scale is calibrated for “off-track” Travel Speeds

K395 CONFIGURATION

ON-TRACK SETUP CONFIGURATION

The Track Model tractor can be configured for left or right side welding to over 7.5" (191 mm) outside the right or left sides of the track sections with forward or reverse travel directions.

The K395 LT-7 is shipped set up for right side welding. If the left side welding is desired, or for left or right conversion, proceed per the following instructions:

NOTE: Right side of tractor welding is recommended when using the K277 Tiny Twinarc® Kit to provide optimum tractor stability.

A. **Rear Wheel Configuration** (See Figure C.26)

NOTE: Changing the wheels requires a "Snap Ring" tool.

For Left side welding, install the rail wheel assembly, without the nylon bushings, on the left side of the tractor with the grooved wheel of the combination wheel assembly to the left (outside). Install the gear wheel assembly on the right side of the tractor with the gear on the inside of the combination wheel assembly.

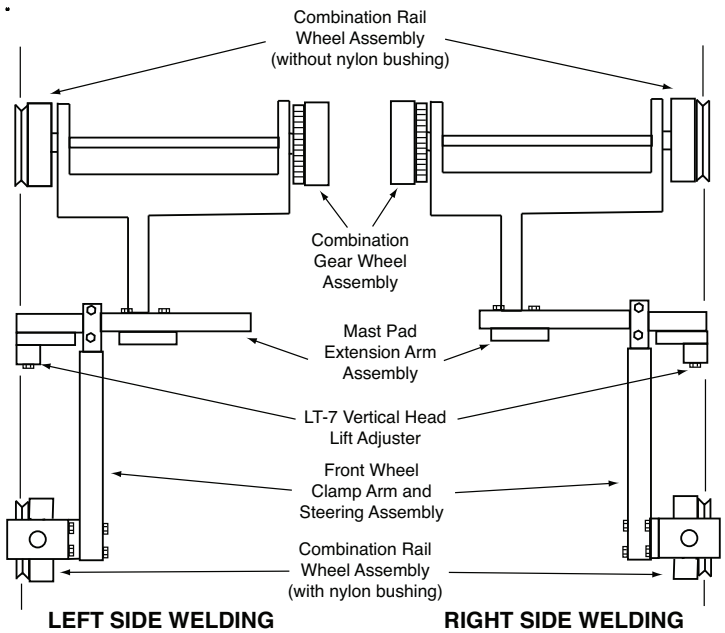
For Right side welding, install the rail wheel assembly, without the nylon bushings, on the right side of the tractor with the grooved wheel on the outside of the combination wheel assembly. Install the gear wheel assembly on the left side of the tractor with the gear on the inside of the combination wheel assembly.

NOTE: Be sure the axle keys are properly installed, and that there is only one flatwasher between each wheel and its retaining snap ring

B. **Front Frame Configuration** (See Figure C.26)

1. Mount the front rail wheel assembly, with nylon bushings, to the steering assembly with the grooved wheel on the right for right side welding, or on the left for left side welding.
2. Configure the converted front steering wheel assembly so it is mounted on the right side of the clamp arm for the right side welding, or on the left for the left side welding. Check that the steering assembly is set for straight travel.
3. Mount the converted front wheel clamp arm assembly to the Mast Pad Extension Arm so the clamp is about 1/4" (6.4 mm) from the forward-facing Mast pad of the arm. The mast pad should be to the right side for right side welding, or to the left side for left side welding.
4. Mount the Mast pad extension arm to the rear of the tractor frame Mast pad with the extension Mast pad on the right side of the tractor for right side welding, using the two arm mounting holes furthest away from the Mast pad. For left side welding, mount the Mast pad on the left side of the tractor using the two arm mounting holes nearest to the mast pad.
5. Adjust the front wheel clamp arm so the front groove wheel aligns with the rear groove wheel.
6. Bolt the LT-7 vertical head lift adjuster to the Extension Arm Mast pad with the LT-7 head assembly mounted to the mast as required for left or right side welding.
7. Except for Horizontal Fillet-lap joint configurations, the flux hopper should be mounted on the side of the head closest to Track center.

FIGURE C.26 - TRACK WELDING CONFIGURATION



LT-7 TRACTOR

Return to Section TOC
Return to Master TOC

K395 CONFIGURATION (CONT.)

OFF-TRACK SETUP CONFIGURATION

The K395 Track Model LT-7 can be setup for any configuration, with any accessory, of the standard K227 LT-7 simply by:

1. Remounting the vertical head lift adjuster to the LT-7 frame Mast pad.

2. Unbolting the extension Mast pad from its crossarm.

K400 LT-7 Track Conversion Kit

The K400 kit allows field conversions of any code K227 standard LT-7 Tractor to a track model tractor, comparable to the K395 LT-7, for use with the K396 Track Sections.

Use the **ON TRACK SETUP CONFIGURATION** instructions for proper installation to perform 'Right Side" or 'Left Side' welding.

K400 Conversion Kit Parts (See *Figure C.26*)

1. **S17632 - Gear Wheel Assemby**
   Replaces a standard LT-7 rear wheel using the snap ring, washer and key removed with the standard wheel.

2. **S17634-1 - Rail Wheel Assembly** (without nylon bushings)
   Replaces a standard LT-7 rear wheel using the snap ring, washer and key removed with the standard wheel.

3. **S17634-2 - Rail Wheel Assembly** (with nylon bushings)
   Replaces a standard LT-7 front wheel using hardware removed from the standard wheel.

4. **S17630 - Mast Pad Extension Arm Assembly**
   Replaces the standard LT-7 Cross Arm using the removed bolts and washers.

5. **M13469-5 Travel Box Nameplate**
   Remove the LT-7 Travel Control box speed control knob and the two phillips head screws securing the nameplate

6. **S15184-1 - Control Box Extension Post**
   Raises Control Box to face to the right.
   NOTE: Older LT-7 Tractors, with a shorter head cable, may not permit mounting the control box facing the right side, but will permit forward facing controls.

7. **M12700-2 - 24" (.6m) Weld Cable Assembly**
   For applications requiring a further reach to the nozzle than permitted by the standard 18' (.45m) cable.

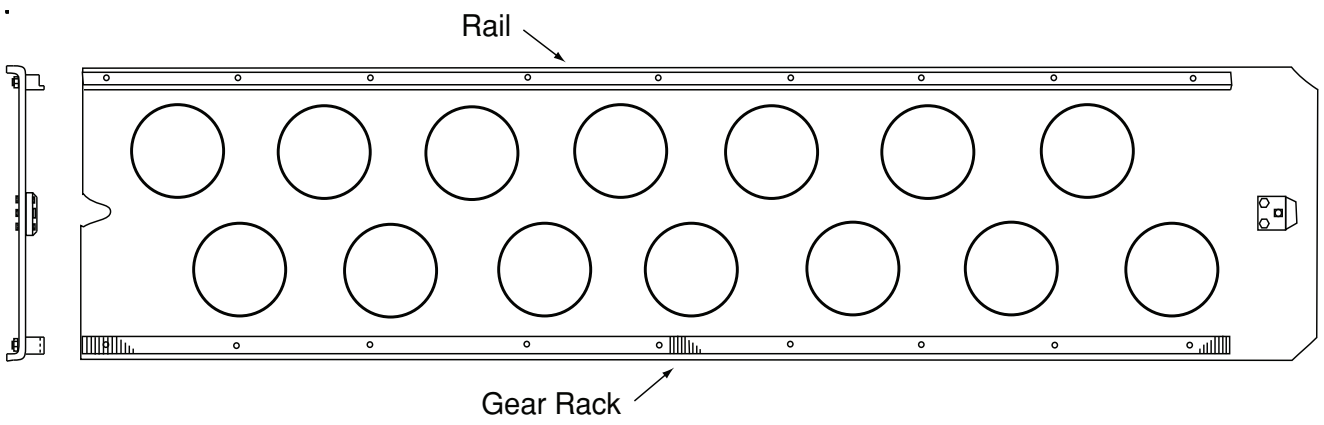
K396 Track Sections (Figure C.27)

The Track Sections are designed for use with a K395 Track Model LT-7 Tractor, or with a K227 LT-7 Tractor with K400 LT-7 Track Conversion Kit installed.

Each 70" (1.7 m) track section is made of 13.3" (338 mm) wide 14 gauge sheet metal channel with .36" (9.1 mm) legs which sit on the floor. A rack and an L-shaped rail are fastened near opposite sides of the top surface. The Track should be laid so all welding is performed on the L-shaped rail side of the Track.

The lightweight, 16.5 lbs (7.4 kg) track sections smoothly slide together and provide self-aligned coupling and uncoupling without the use of any tools. This allows for "Leap-frogging" of track sections so that any desired weld length can be accomplished quickly and precisely.

FIGURE C.27 - TRACK SECTION

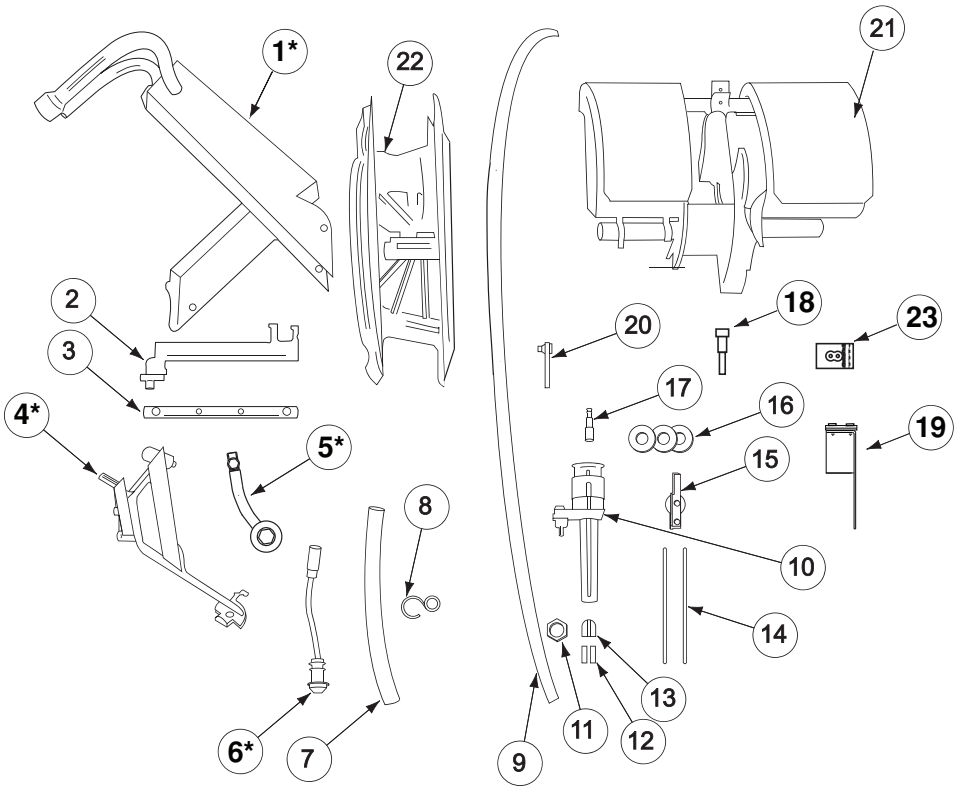


LT-7 TRACTOR

Return to Section TOC
Return to Master TOC

K277-1 AND K277-2 TINY TWINARC® KITS FOR SUBMERGED ARC WELDING

The optional **K277-1** and **K277-2 Tiny Twinarc® Kits** provide all of the parts required to convert the LT-7 tractor, in conjunction with its other optional accessories, to a tractor capable of welding all joint configurations, using Tiny Twinarc welding procedures employing either two 5/64" (2.0 mm) or two 3/32" (2.4 mm) electrodes.



* Items 1, 4, 5 & 6 are for "Flat Fillet" welding and are only included in the **K277-2**

K277 TINY TWINARC® PARTS

1. Reel Adapter *
2. Front Stabilizer Wheel
3 Rear Wheel Support Arm
4. Front Wheel Support *
5. Rear Wheel Support *
6. Travel Motor Extension Cable *
7. Flux Hose
8. Hose Clamp
9. Wire Guide Tube (5 ft.)
10. Nozzle Body
11. Nozzle Collar
12. Contact Tips (2 for 5/64" and 2 for 3/32" wire)
13. Tip Holder(includes 2 Nozzle inserts)
14. Guide Tubes (2)
15. Idle Roll Arm
16. Drive Rolls (2 outside and 1 inside roll)
17. Outgoing Guide Tube
18. Incoming Guide Tube
19. Wire Guide Support
20. Head Spring Extender
21. Twin Reel Mounting
22. Wire Reel
23. Slide Bushing

LT-7 MODIFICATION FOR TWINARC® WELDING

A. WIRE FEED HEAD MODIFICATIONS FOR TINY TWINARC®

1. Wire Straightener Modifications (Figure C.28)

   a. Remove the standard single wire straightener from the LT-7 tractor.

   b. Remove and save roll pin (Item 6).

   c. Remove the screw bushing (Item 5).

   d. Remove the slide screw assembly (Item 4) from the single hole slide bushing (Item 8).

   e. Re-assemble the slide screw assembly (Item 4) into the unit using the new double hole slide bushing that came with the kit. (See drawing for proper orientation).

   f. Replace the screw bushing (Item 5); screw onto threads with the small end first. Tighten it back into the straightener frame until the roll pin holes in the bushing and the screw are lined up. Replace the roll pin (Item 6) removed in Step (b). Apply a little grease to the screw threads.

   g. Remove the nut and lock washer from the bearing mounting screw (Item 9).

   h. Remove the 10-24 screw, lock washer, and nut from the wire guide support (Item 2) which came with the kit, mount the support to the straightener body using the hex nut and lock washer removed in Step (g).

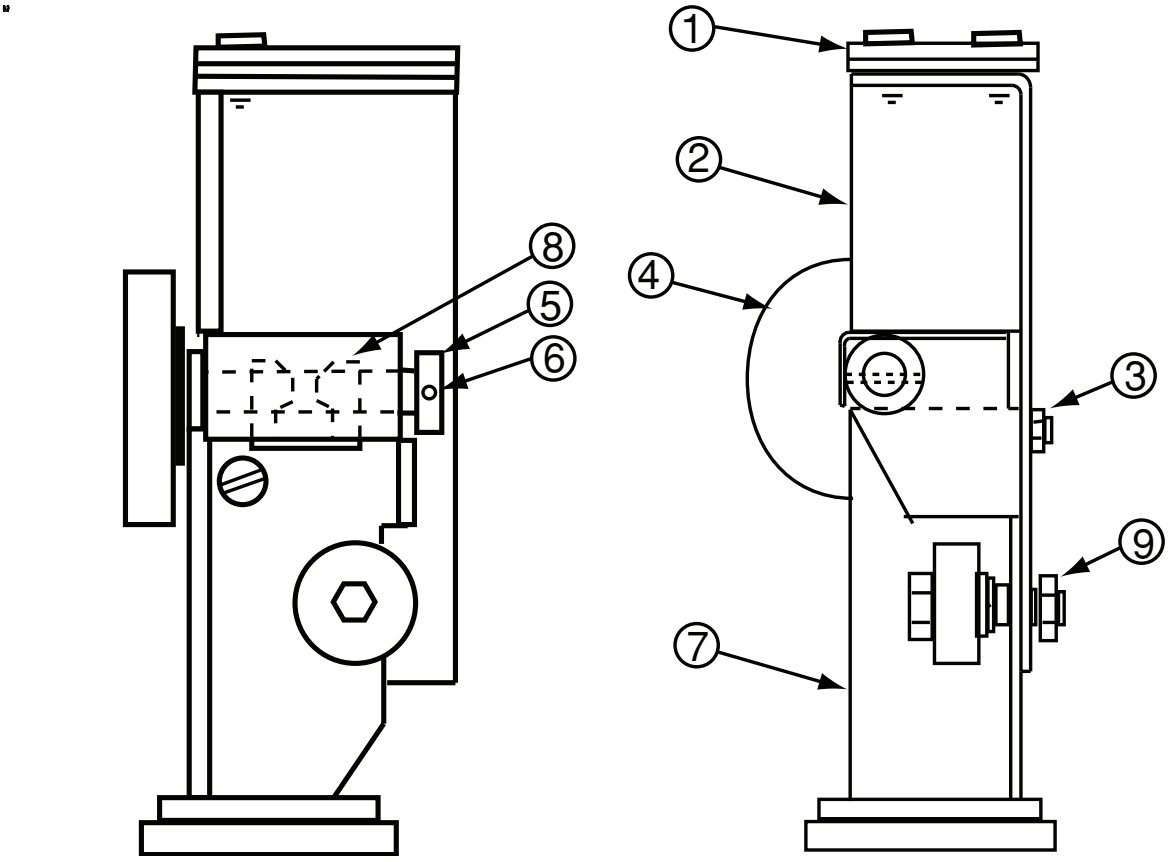
   i. Install the 10-24 screw, lock washer and nut (item 3) as shown.

   NOTE: Earlier straightener bodies will not have a hole to receive the screw. Use a 13/64" (.203) diameter drill to provide a hole for the screw].

   j. Remove the single hole ingoing guide tube from the wire feed unit and install the two hole incoming guide tube which came with the kit. Snug up the set screw into the indent of the guide tube. Do not overtighten the set screw.

   k. Install the new straightener assembly to the wire feed unit.

FIGURE C.28 - TWINARC® WIRE STRAIGHTENER



LT-7 TRACTOR

Return to Section TOC
Return to Master TOC

LT-7 MODIFICATION FOR TWINARC® WELDING (CONT.)

2. Remove the entire head assembly from the clamp block on the cross seam adjuster.

3. Remove the head mounting pivot plate and its insulation by removing the two hex bolts (See Figure C.29).

4. Remove the idle roll arm assembly:
   a. Remove arm pressure screw and spring.
   b. Loosen arm pivot pin set screw and remove the pivot pin.

5. Remove the single wire drive rolls and replace them with the Tiny Twinarc drive rolls. Install the three roll assembly with the narrow roll sandwiched between the two wider rolls (See Figure C.29).

6. Install the kit pivot idle roll arm using the hardware removed with the standard idle roll arm.

7. Remount the head mounting pivot plate with its insulation which was removed in step (3).

8. Remove the nozzle and hold down clamps and screws.

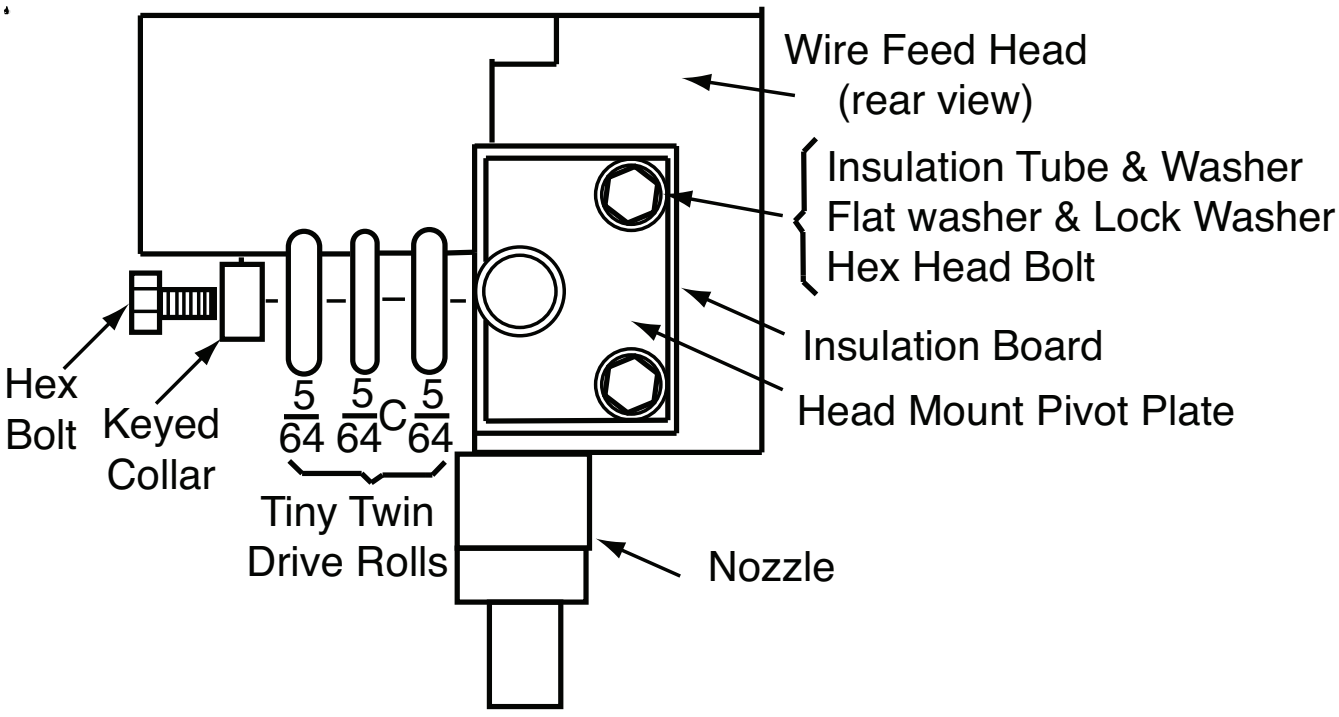
9. Remove the single wire outgoing guide tube by loosening its set screw and replace it with the Tiny Twinarc kit outgoing tube, being sure that the set screw seats into the relief provided in the guide tube.

10. Mount the Tiny Twinarc nozzle using the socket head screws and lockwashers supplied in the kit.

11. Do not remount the Feed Head assembly into the cross seam adjuster clamp block before making all frame modifications required in steps **(B)** and/or **(C)**.

12. Store all left-over parts that were removed for future use.

FIGURE C.29 - DRIVE ROLL INSTALLATION



LT-7 MODIFICATION FOR TWINARC® WELDING (CONT.)

B. FRAME MODIFICATIONS FOR BUTT WELDS, HORIZONTAL FILLET OR LAP WELDS WITH TINY TWINARC®.

Other than the following modifications, the Tiny Twinarc LT-7 tractor is set up in the same manner as the single arc LT-7 tractor for the same joint configuration.

Store all parts that are removed from the tractor and that are not being used for the current welding process for future use.

1. **Frame Conversion** (For butt welds and horizontal fillets)

   a. Remove the single wire reel and Control Box Mount by removing the two hex bolts and nuts securing it to the main frame of the tractor.

   b. Mount the kit's double wire reel frame to the main frame using the same mounting method and hardware as used to secure the removed single reel frame. See Figure C.30

   c. The longer, 5 ft (1.5 m), kit wire guide tube is used in conjunction with the 4 ft. (1.2 m) tube to guide the wire off the left reel for the right side butts, and vice versa.

2. **Butt Welds (Tiny Twinarc)**

   a. The flux hose tube and tip are to be replaced with the kit's flux hose without tip. The flux hose clamp is installed over the O.D. of the nozzle tip. Make certain the tips are proper size for the wire to be used. See Figure C.31.

   b. Install the stabilizer wheel attachment to the front mast mounting arm by clamping it onto the mounting arm just behind the cross arm and extending to the left side when facing the front of the tractor. The wheel side is to be down when it is clamped into place the wheel will be approximately 1/8" (3.2 mm) off the work surface. See Figure C.32.

   c. For welding slightly open butt joints or prepared butt joints, the use of the K230 Vee Butt Weld Guide is recommended. See ***Steering Methods and Figure C.11***.

FIGURE C.30 - FRAME CONVERSION

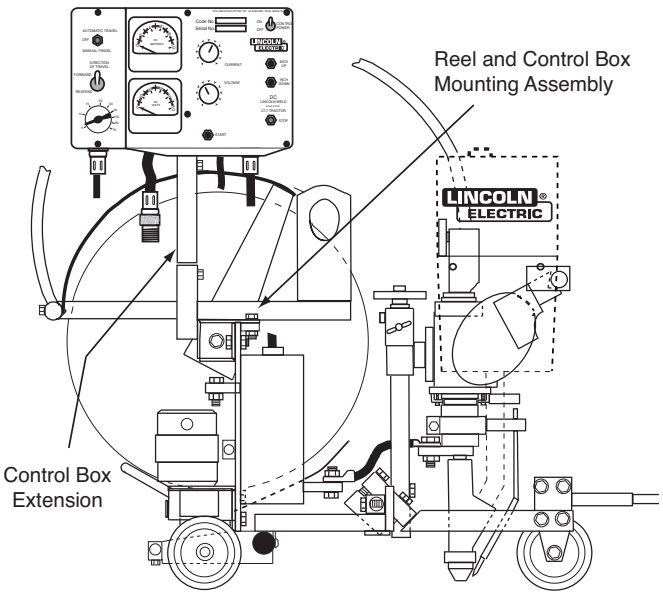


FIGURE C.31 - FLUX HOSE CLAMP

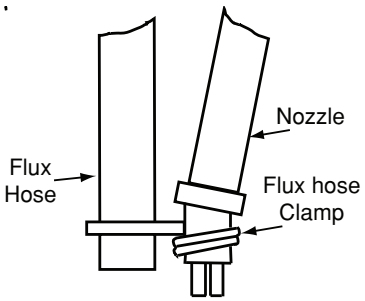
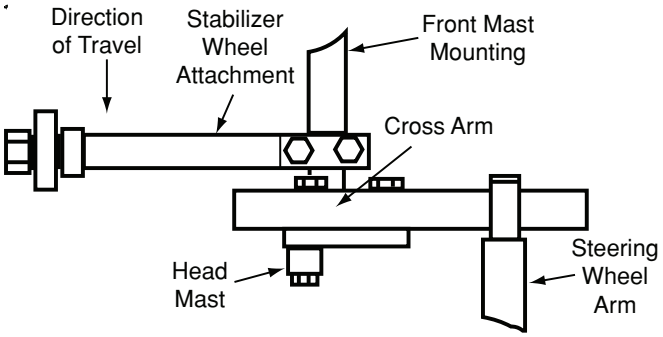


FIGURE C.32 - STABILIZER WHEEL



TOP VIEW

LT-7 MODIFICATION FOR TWINARC® WELDING (CONT.)

3. Horizontal Fillet Welds (Tiny Twinarc)

a. The longer, 5 ft (1.5 m), kit wire guide tube should be used in conjunction with the 4 ft (1.2 m) tube to guide the wire off the right reel for right side fillet-laps, and vice versa.

b. Install the kit stabilizer wheel attachment as described in ***Butt Welds***.

c. See the ***Setup for Horizontal Fillet Welding*** for mounting instructions of the **K232 Fillet / Lap Guide.**

d. Right side fillets are set up the same as single wire right side fillets except for Step e-4 below.

e. Left side fillet-laps require the following modifications to the single wire setup procedure:

1. Remove the entire head assembly from the clamp block on the cross seam adjuster.

2. Reverse the mounting of the cross seam adjuster on the LT-7 mast so it extends toward the left with the clamp block hole above the cross seam adjuster barrel. Then re-install the head assembly. See Figure C.33.

3. Bolt the kit head spring extender to the "L" hole on the LT-7 head spring hook and use the hole on the far end when installing the head spring attachment. See Figure C.34.

4. Remove the bearing roller from the rear support wheel assembly (S15280) of the K232 fillet kit. Transfer this roller to the extended rear wheel support arm which is part of the K277-1 or -2 horizontal fillet kits.See Figure C.35.

NOTE: Step 4 is not necessary for right hand fillets.

f. For left horizontal fillets install the Support Arm assembly as shown in Figure C.35.

g. Adjust the head position with the cross seam adjuster until the rear wheels are "toed" approximately 1/2° to 1° into the vertical plate as shown in Figure C.36.

FIGURE C.33 - CROSS SEAM ADJ.

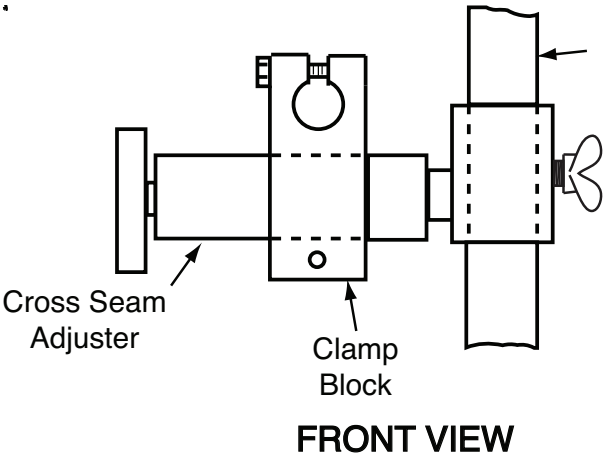


FIGURE C.34 - SPRING EXTENDER

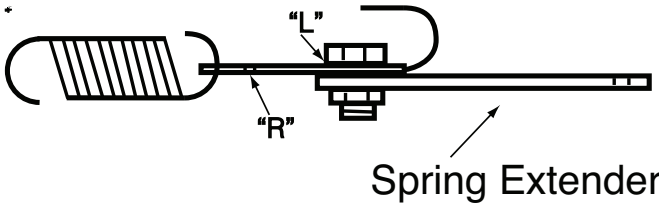


FIGURE C.35 - EXTENDED SUPPORT ARM

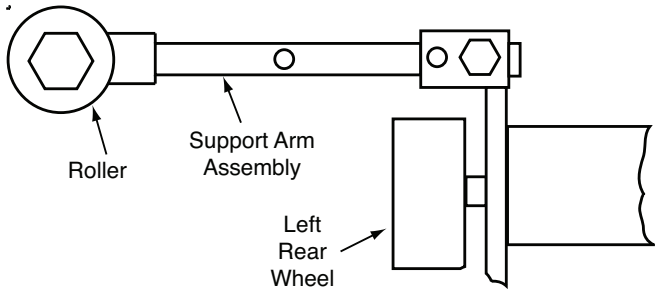
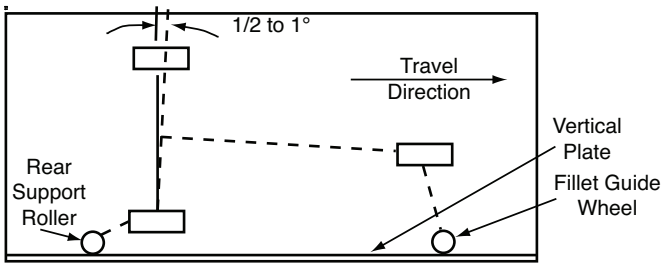


FIGURE C.36 - HEAD ADJUSTMENT



LT-7 MODIFICATION FOR TWINARC® WELDING (CONT.)

4. Horizontal Lap Welds (Tiny Twinarc)

Left and right lap welds are set up with the same procedures and equipment used for single arc horizontal fillets, except:

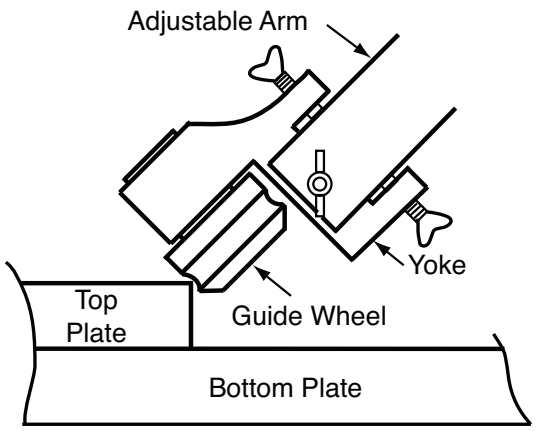
a. The fillet wheel yoke is replaced by the lap wheel yoke (single grooved wheel) - part of the K232 kit.

1. The lap wheel yoke mounts with the wheel on the right of yoke for left laps (vice versa for right laps.)

2. The lap wheel rides on the corner of the top plate of the lap joint. See Figure C.37.

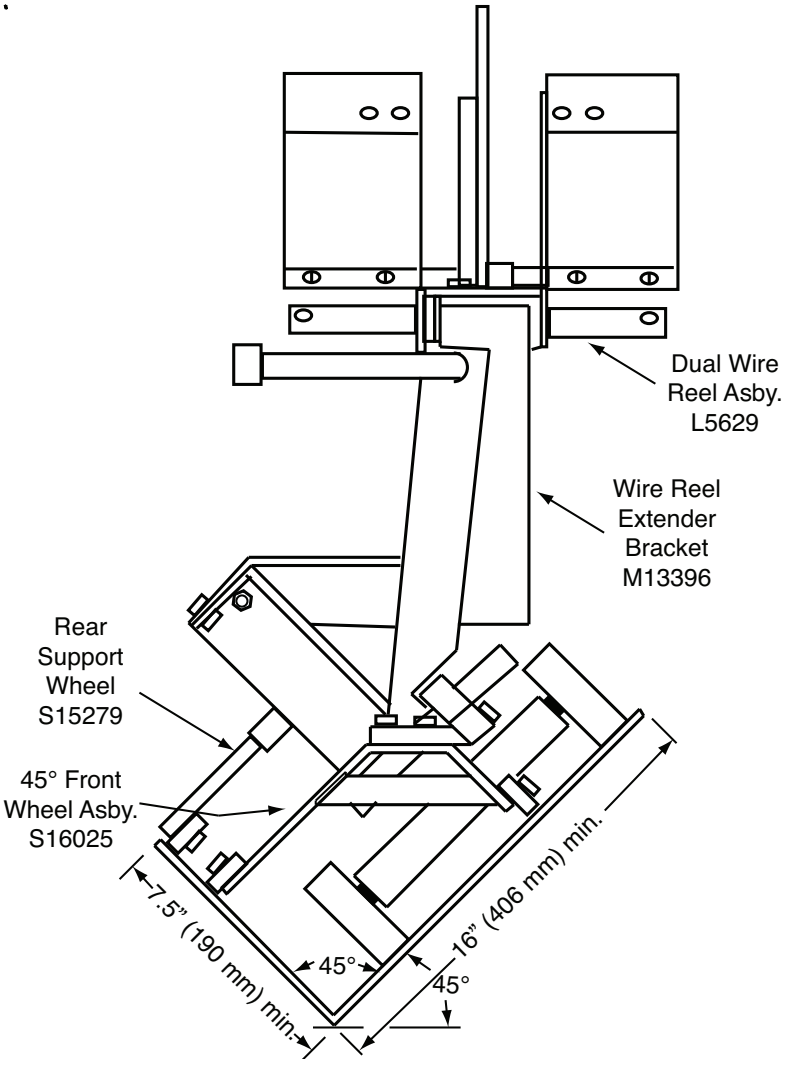
b. The rear fillet support wheel attachment is not required. For left laps the left rear wheel should be approximately 8" (2.4 m) from the seam, and for right laps the right rear wheel should be 5" (1.5 m) from the seam.

FIGURE C.37 - LAP WHEEL



Left Side Lap Weld

FIGURE C.38 - TINY TWINARC® FLAT FILLET FINAL ASSEMBLY



LT-7 TRACTOR

Return to Section TOC
Return to Master TOC

LT-7 MODIFICATION FOR TWINARC® WELDING (CONT.)

C. Frame Modifications for Twinarc® 45° Flat Fillets.

1. Shut the power off and disconnect the input cables to the LT-7 tractor.
2. Disconnect the travel drive motor and wire feed motor from the control box and then remove the control box from its mounting socket and lay the box on the floor.
3. Remove wire reel.
4. Remove the single wire reel frame by removing the two hex bolts and nuts securing it to the main frame of the tractor. (Save the mounting hardware; it will be used to remount the new wire reel extender bracket.)
5. Remove the wire feeder, flux hopper assembly and cross seam adjuster from the main mast.
6. Remove the front wheel clamp arm and front wheel assembly from the cross beam.
7. Reposition the main mast to the 45 degree position **(See *K229 - Flat Fillet Head Mounting*** for mast position).
8. Remove the cross beam.
9. Install the Twinarc wire reel extender bracket M13396 to the tractor frame using the mounting hardware from Step 4. Assemble the nuts and bolts but leave them relatively loose at this stage.
10. Sandwich the cross beam it between the notched vertical support arm of the bracket and the mast mounting plate of the tractor frame. The end of the cross beam with the tapped holes should be to the right and the two holes that are closest to the center of the cross beam should be used as the mounting holes. Install and tighten the 3.8” (9.5 mm) x 1.75” (44.5 mm) hex head screws that were taped to the bracket, and also tighten the two bracket mounting screws of Step 9. (See Figure C.39).
11. Remove the front wheel assembly and spacer pad from the clamp arm. Install the 45 degree front wheel beam. The exposed end of the cross beam should be 2.50” (63.5 mm) for the proper positioning of the wheels with respect to work piece. (See Figure C.40).
12. Perform the ***Wire Feed Head Modification*** procedure if it has not already been done.

FIGURE C.39 - REEL EXTENDER

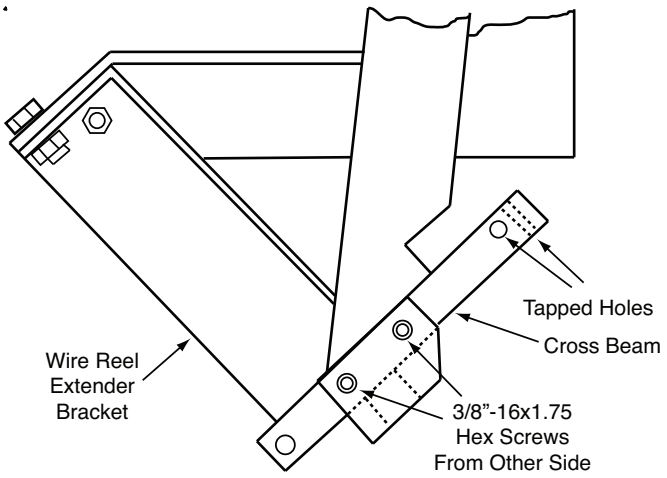
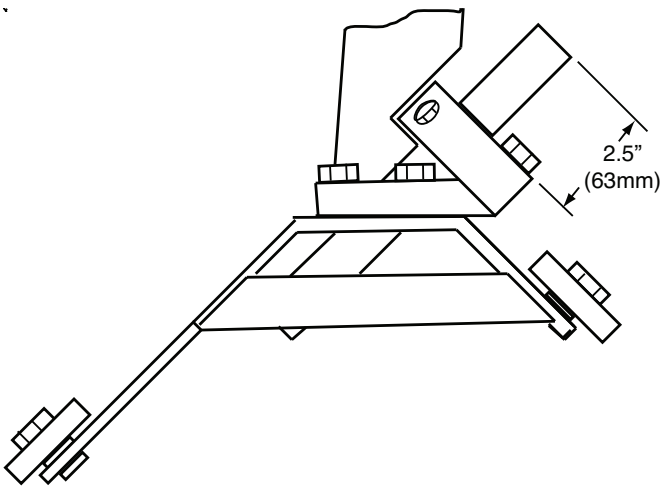


FIGURE C.40 - REEL EXTENDER



LT-7 MODIFICATION FOR TWINARC® WELDING (CONT.)

C. Frame Conversions for Twinarc® 45° Flat Fillets (continued)

13. Mount the cross seam adjuster to the left of the mast with hole in the clamp block down as shown in Figure C.41. Centrally locate the clamp block on the cross seam barrel within +/- 1/4" (6.4 mm).
14. Mount the wire feeder into the clamp block.
15. Mount the flux hopper to the left side of the bumper handle as shown:
16. Screw the flux hose clamp onto the O.D. of the nozzle tip adapter. See Figure C.42.
17. Install the flux tube from the hopper to the flux hose clamp as shown in Figure C.42. (Cut flux hose length to suit.)
18. Install the rear support wheel (S15279) with the roller down and the curved arm pointing to the rear of the tractor into the mounting socket which is on the tractor frame just in front of the travel motor.
19. Mount Twinarc dual wire reel assembly, L5629, to the wire reel extender arm. (See ***Figure C.38***). Use the two 3.8" (9.5 mm) x .875" (22.2 mm) hex head screws that come with the bracket.
20. Mount the control box into the socket which is on the end of the curved arm of the reel extender. Face of the control box should be to the left.
21. Reconnect wire feed unit to the control box.
22. Install the travel motor extension cord and connect it to the control box.
23. Reconnect the input cables to the LT-7 tractor. Retape the cable group in such a manner that any pulling strain is put onto the welding cables and not the control cable.
24. Install the two nylon wire guides (the short one to the left sidereel, the longer one to the right side reel.)
25. Adjust the head to the proper position over the joint to be welded. (Check welding procedure parameters for proper settings.)

Store all parts that were removed from the tractor and that are not being used for the current welding process for future use.

FIGURE C.41 CROSS SEAM ADJUSTER

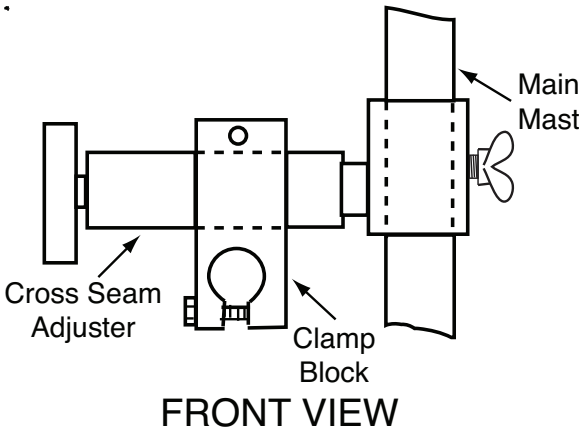
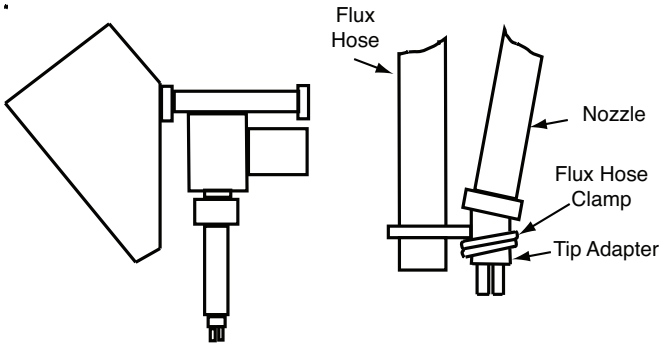


FIGURE C.42 - FLUX HOPPER MOUNTING



K280 VERTICAL HEAD LIFT ADJUSTER
(Obsolete - Standard on codes Above 7948)

The vertical head lift adjuster provides 1.50" (38.1 mm) of travel by turning the adjusting wheel on top of the mast. Major adjustment can be quickly made by loosening the hand operated locking screw, moving the head to the required position and tightening the locking screw.

1. Remove the complete wire feeder/flux hopper assembly from he vertical mast clamping screw and slide the entire assembly up and off the mast.
2. Remove the vertical mast from the tractor frame by removing the two hex head bolts which fasten the mast to the frame.
3. Remove the paper tape that is holding the two mounting screws in the vertical adjusting mast.
4. Mount the mast to the tractor frame and tighten the two mounting bolts securely.
5. Remove cross seam adjuster mast clamping screw and replace it with the locking screw which is taped to the vertical lift mast. See Figure C.44.
6. Remount the complete wire feeder flux hopper assembly onto the new vertical lift mast. Lock at the desired height using the locking screw.
7. Mount the hand adjusting knob, with the lock washer and nut and tighten securely.
8. Store the vertical mast and hardware that was removed for future use.

FIGURE C.43 - K280

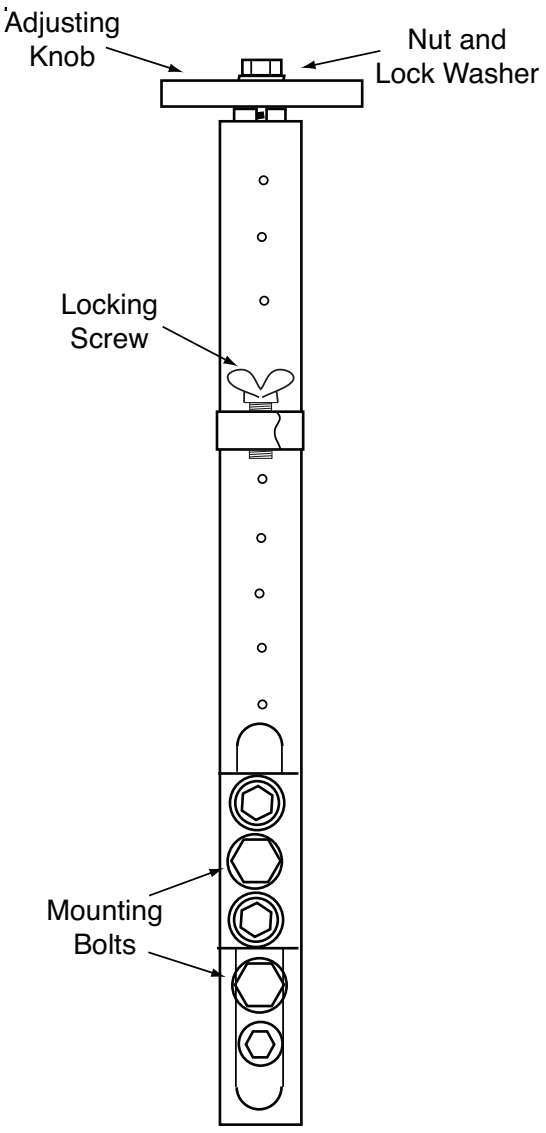


FIGURE C.44

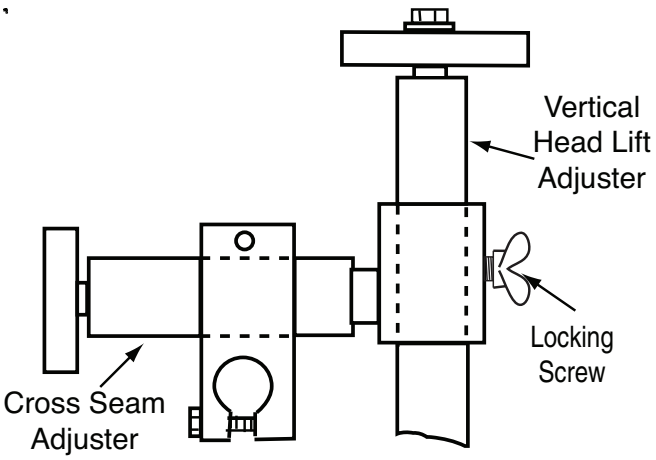
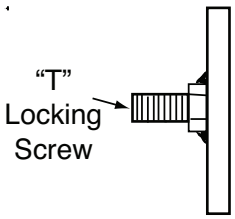


FIGURE C.45

NOTE: Earlier units had a "T" Locking Screw instead of a Wing Screw



NOTES

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

TABLE OF CONTENTS - ELECTRICAL INSTALLATION

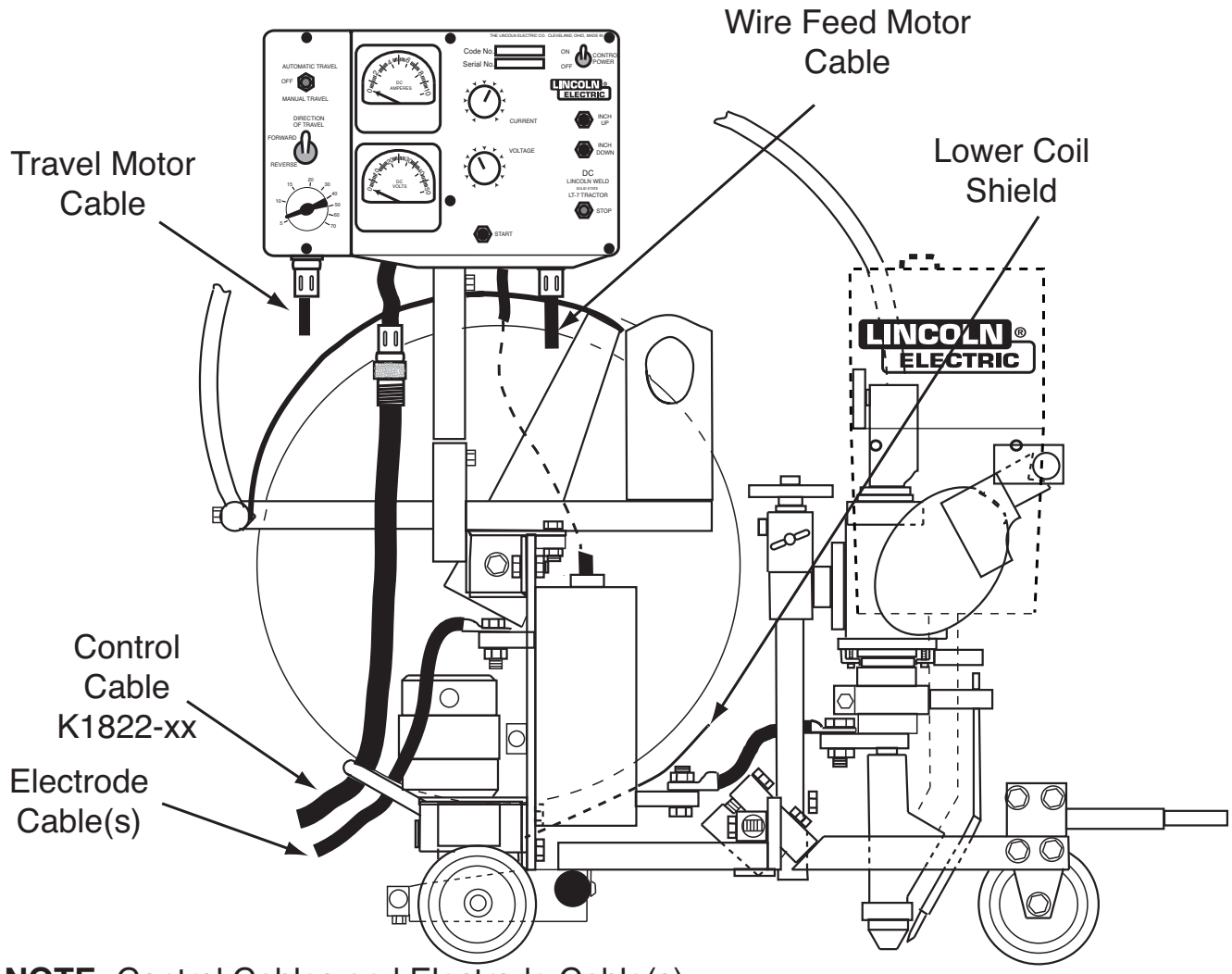
Return to Master TOC

Return to Master TOC

Return to Master TOC

Return to Master TOC

FIGURE D.1 - LT-7 TRACTOR ELECTRICAL CONNECTIONS



NOTE: Control Cables and Electrode Cable(s) must be ordered separately (see Required Options).

CAUTION

A common mistake when setting up an LT-7 or installing optional equipment is to allow an electrically conductive path to occur between the welding head and the tractor frame. This can happen accidentally if a piece of wire or an extra metal washer forms a “bridge” across an insulator or if something gets bent and touches something it should not touch. If this occurs the wire may not inch down and the wire will feed backwards and possibly arc to the frame causing a “ground fault” when the START button is pushed. Another common occurrence is for leads #67 or #21 to be misconnected or broken which can cause the same symptoms.

To avoid these situations, be sure to use ALL insulators provided. After installation, if these symptoms occur, test resistances per Table D.1. If the test results are different than the expected resistances consult the ***Troubleshooting Guide***.

TABLE D.1

Test Points	Expected Resistances	Comments and Conditions
Lead #67 at the Voltmeter to Electrode Wire	Zero or less than 1 ohm	Electrode wire must be in the drive rolls
Lead #21 to work piece	Zero or less than 1 ohm	Polarily switches must be in the correct position
Lead #67 to Lead #21	Greater than 1K ohms	Before testing disconnect the welding cable(s) from the contact assembly

Return to Section TOC
Return to Master TOC

It may be an advantage to do the mechanical set-up for the particular application before connecting the cables.

1. The LT-7 requires 350 volt-amperes of 115 volt single phase 60 or 50 Hz power. Additional power is needed when a light (120 v/1a max.) is plugged into the outlet on the bottom of the control box. This AC power is available from the Lincoln power sources.

2. The LT-7 is shipped, with the CV-VV switch inside the control box set to VV so it is ready to operate with a constant current power source. If the constant current process is desired, be sure that multi-process power sources are set in the Constant Current mode per the instructions in the power source operating manual.

NOTE: The term Constant Current (CC) was formerly known as Variable Voltage (VV). To weld in the Constant Voltage (CV) Mode, see ***MODE SELECTION*** in Section E of this manual.

4. Connect the input cable to the power source exactly as specified on the appropriate connection diagram found in the LT-7 Operator's Manual. Include all jumpers on the terminal strips as shown on the diagrams, but do not add any jumpers not shown. If using an SAF-600 or SA-800 motor-generator power source, also include the K224 Solid-State Field Control (obsolete) as shown in the diagram.

NOTE: To connect Lincoln power sources not covered by the Connection Diagram Section, consult the factory (1-888-935-3877) giving the Code Numbers for both the power source and LT-7.

5. Thread the Control Cable (K1822-xx) and Electrode Cable(s) up through the strain relief ring at the rear of the tractor. Connect the polarized plug on the control cable to the mating receptacle below the control box. Connect the electrode cable(s) of approiate size (see Table D.2) to the tab extending out of the top of the shunt box using the bolt and nut provided. See ***Figure D.1***.

6. Connect the short length of electrode cable between the front tab extending out of the tractor shunt box to the contact nozzle assembly. Route this cable under the lower coil shield and around the right side of the mast (looking at front of tractor) over the crossbeam. See ***Figure D.1.*** Be sure the cable does not interfere with the wire reel rotation and the connections do not make contact with any part of the tractor frame.

7. Connect a work lead of sufficient size and length (refer to Table D.2) between the " Work" stud on the power source and the workpiece. Be sure the connection to the work makes a tight and clean metal-to-metal contact.

TABLE D.2 - RECOMMENDED COPPER CABLE SIZES FOR ARC WELDING

Machine Size in Amperes	Duty Cycle %	Combined Lengths of Electrode & Work Cable			
		0-100' (0-30 m)	100-150' (30-45m)	150-200' (45-60m)	200-250' (60-75m)
600	60	#3/0	#3/0	#4/0	(2) #3/0
600	80	(2) #1/0	(2) #1/0	(2) #2/0	(2) #3/0
600	100	(2) #1/0	(2) #1/0	(2) #2/0	(2) #3/0
650	60	#3/0	#4/0	(2) #2/0	(2) #3/0
650	80	(2) #1/0	(2) #1/0	(2) #2/0	(2) #3/0
800	80	(3) #1/0	(3) #1/0	(2) #3/0	(2) #4/0
800	100	(2) #3/0	(2) #3/0	(2) #3/0	(2) #4/0
1000	80	(2) #4/0	(2) #4/0	(2) #4/0	(4) #2/0

Return to Section TOC
Return to Master TOC

Loading a Coil on to a Reel

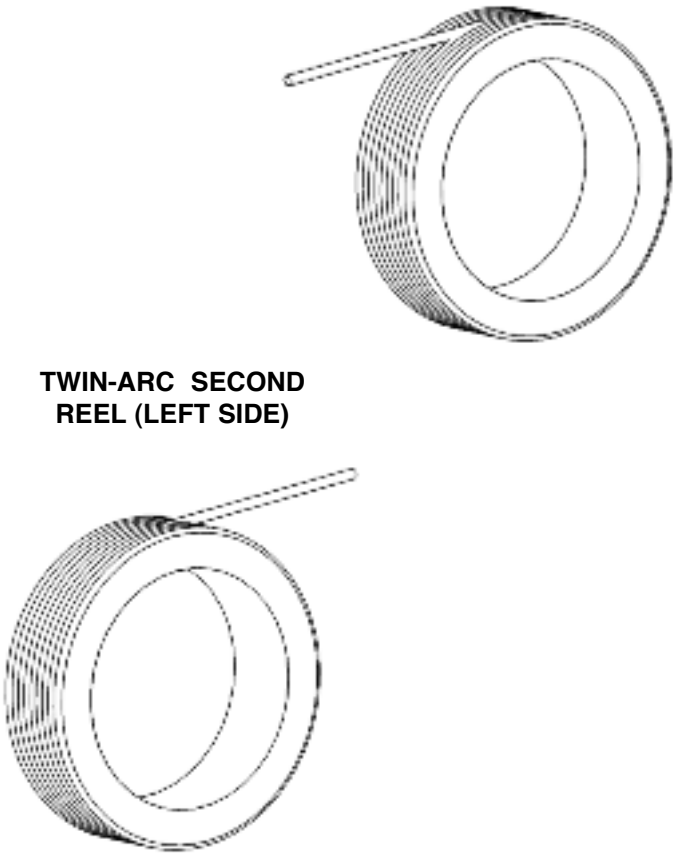
1. Turn the power OFF at the welding power source.

2. Determine the direction the wire will payoff from the spool.

   For single arc applications place the coil on the reel so that it unwinds as the reel rotates *counter-clockwise.*

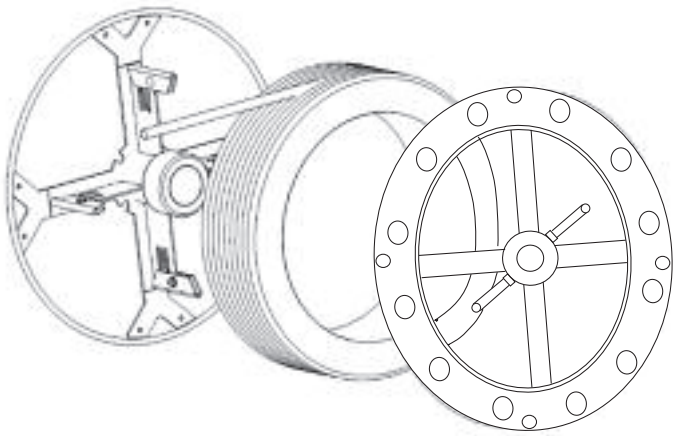
   For Tiny Twin-arc applications, the second coil will need to be set to pay off in the opposite (*clockwise*) direction. See Figure D.2.

FIGURE D.2
SINGLE ARC (RIGHT SIDE)
TWIN-ARC SECOND REEL (LEFT SIDE)



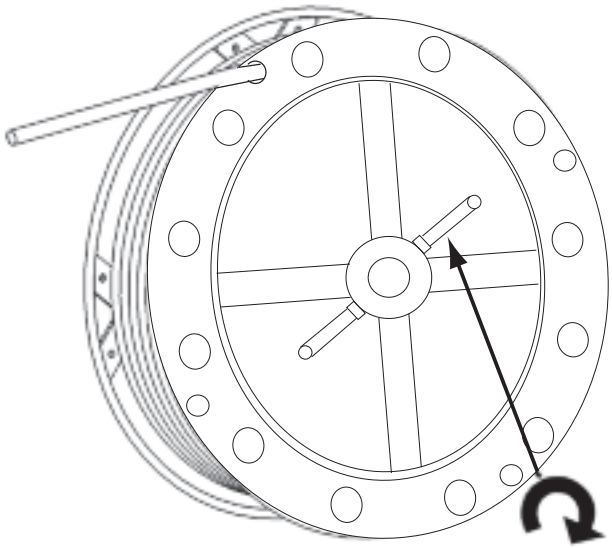
3. Place the coil on the reel. Align cover plate spokes to reel spokes and assemble. See Figure D.3.

FIGURE D.3



4. Tighten the spinner nut as much as possible by hand. See Figure D.4.

FIGURE D.4



⚠ CAUTION

Always ensure the free end of the coil is securely held while the tie wires are being cut and until the wire is fully loaded in the wire drive. Failure to do this may result in a tangled coil.

5. Cut and remove only the tie wire holding the free end of the coil. Securely hook the free end of the electrode wire through one of the holes in the cover

6. Cut and remove the remaining tie wires.

7. Place the coil on the spindle and then place the retaining washer and cotter pin in place to hold the reel.

8. Feed the electrode through the insulated electrode take off arm and through the white nylon tube. Leave enough electrode sticking out of the end of the tube to reach through the wire straightener to the drive rolls. Insert the end of the take-off tube into the hole in the take-off arm.

9. Turn the power source ON. Feed the wire through the wire straightener and ingoing guide to the drive rolls and press the “Inch Down” button until the electrode feeds down into the nozzle.

⚠ CAUTION

DO NOT HOLD THE WELDING WIRE WITH BARE HANDS WHILE INCHING DOWN
When Inching Down, a low voltage signal is applied to the weld wire to enable the Auto Stop Circuit. See *Variable Voltage Circuit* in section F.

NOTE: Always install the nylon take-off tube. If not used while welding, the electrically “hot” electrode may touch the control box or tractor frameand cause the machine to stop welding.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

NOTES

TABLE OF CONTENTS - OPERATION SECTION

SAFETY PRECAUTIONS

⚠ WARNING

ELECTRIC SHOCK CAN KILL

- TURN THE INPUT POWER OFF AT THE DISCONNECT SWITCH BEFORE WORKING ON THIS EQUIPMENT.
- DO NOT TOUCH ELECTRICALLY HOT PARTS. ALWAYS WEAR DRY INSULATING GLOVES.
- ONLY QUALIFIED PERSONNEL SHOULD INSTALL, USE OR SERVICE THIS EQUIPMENT.
- WHEN INCHING WIRE DOWN, THERE IS A LOW VOLTAGE APPLIED TO THE ELECTRODE CIRCUIT.
- DO NOT ALLOW PARTS AT ELECTRODE POTENTIAL TO TOUCH THE LT-7 TRACTOR FRAME, FLUX HOPPER OR OTHER PARTS.
- DISENGAGING THE CLUTCH DOES NOT STOP THE WELDING ARC.

⚠ WARNING

MECHANICAL HAZARDS CAN CAUSE SERIOUS INJURY

- DO NOT LEAVE THE LT-7 TRACTOR UNATTENDED WHILE IT IS WELDING OR TRAVELING.
- THE ELECTRODE REEL, DRIVE ROLLS, WHEELS, GUIDE WHEELS AND WIRE STRAIGHTENER ROLLS TURN DURING WELDING OR INCHING.
- KEEPS GLOVED HANDS AWAY FROM ROTATING PARTS THAT MAY CATCH THE GLOVE.
- KEEP AWAY FROM PINCH POINTS.
- DO NOT PLACE THE LT-7 TRACTOR ON INCLINED SURFACES WITH THE CLUTCH DISENGAGED.
- ONLY QUALIFIED PERSONNEL SHOULD INSTALL, USE OR SERVICE THIS EQUIPMENT.

Return to Section TOC
Return to Master TOC

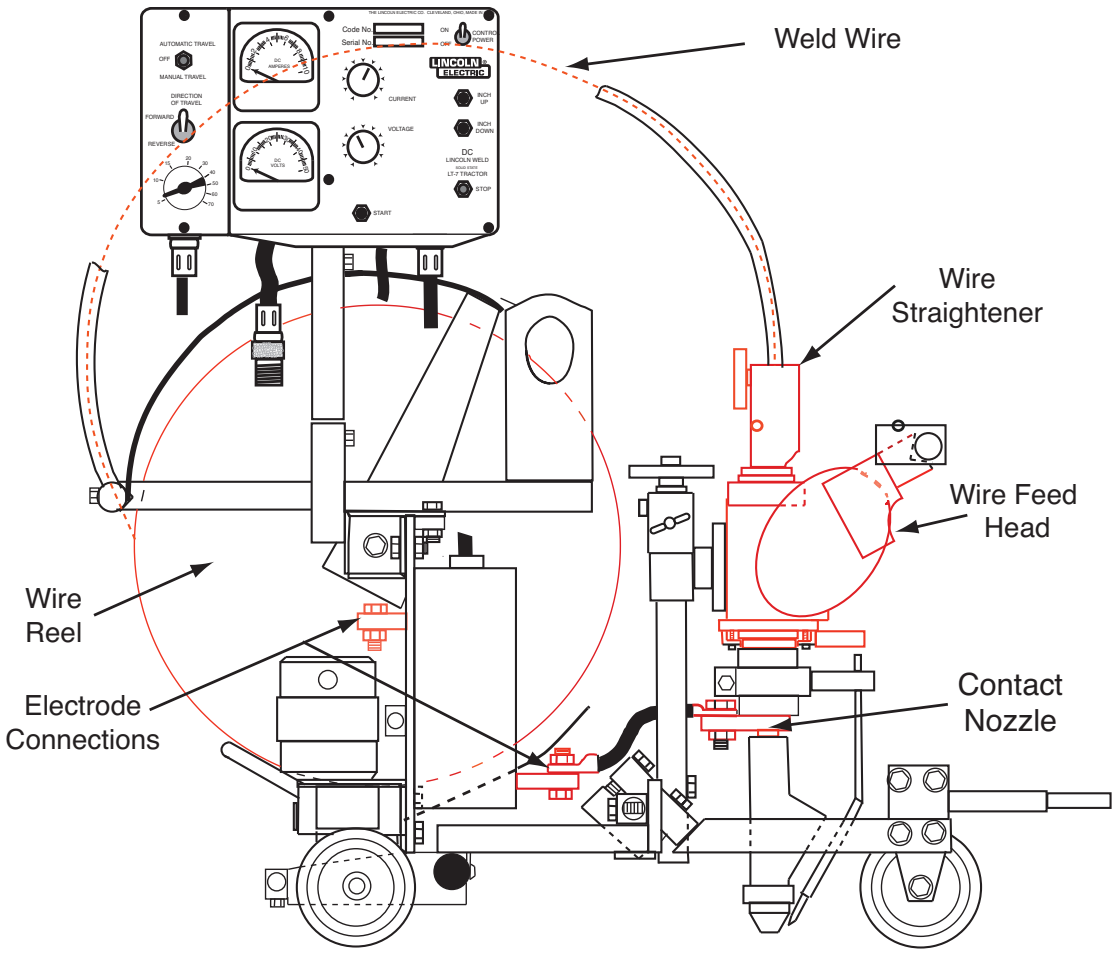
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

⚠ WARNING

ELECTRODE POTENTIAL

- **MAINTAIN CLEARANCE BETWEEN PARTS AT ELECTRODE POTENTIAL AND ALL OTHER TRACTOR COMPONENTS.**
- **PARTS THAT ARE AT ELECTRODE POTENTIAL ARE:**
  - **WELD WIRE**
  - **WIRE SPOOL**
  - **THE ENTIRE WIRE STRAIGHTENER**
  - **THE ENTIRE WIRE FEED HEAD**
  - **ELECTRODE CONNECTIONS**
  - **CONTACT NOZZLE ASSEMBLY.**

FIGURE E-1 - ITEMS AT ELECTRODE POTENTIAL



LT-7 TRACTOR

LINCOLN ELECTRIC

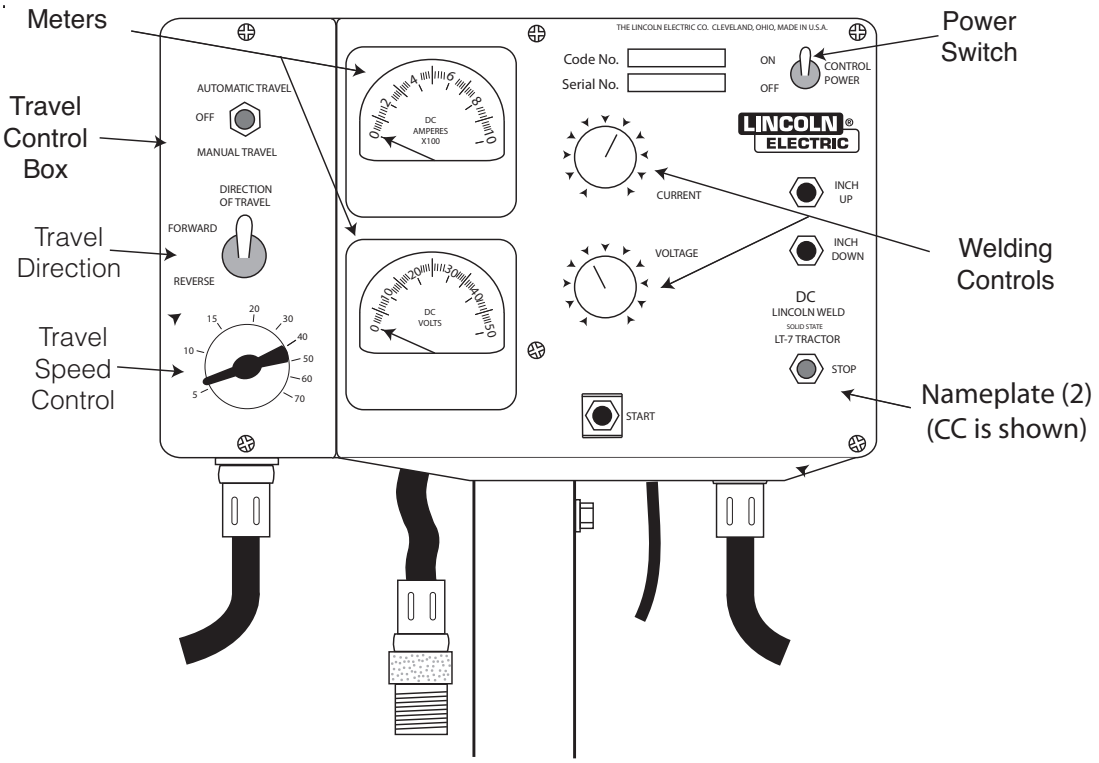
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

⚠ CAUTION

- **Operate the LT-7 Tractor only on stable and dry surfaces.**
- **Operating the LT-7 Tractor on inclined surfaces may require adjusting and / or assembling the tractor differently than shipped from the factory.**
- **Do not submerge the LT-7 Tractor.**
- **It is the responsibility of the user, builder or operator to assemble the LT-7 TRACTOR to maintain safe electrical clearances and stability.**

The serviceability of a product or structure utilizing any welding procedures is and must be the sole responsibility of the builder and/or user. Many variables beyond the control of The Lincoln Electric Company affect the results obtained in applying these procedures. These variables include, but are not limited to, the welding procedure, plate chemistry and temperature, weldment design, fabrication methods and service requirements. The available range of a welding process may not be suitable for all applications, and the builder and/or user is and must be solely responsible for the welding process selection.

FIGURE E.2 CONTROL BOX



1. **POWER SWITCH** - Controls 120vac input to the Control Box.

1. **AMMETER** - Shows 'actual' current while welding.

2. **VOLTMETER** - Shows 'actual' voltage (both OCV and weld volts) after the START button is pressed.

3. **INCH UP Button** - Provides "cold" wire retract.

4. **INCH DOWN Button** - Provides forward feed of wire through the feed head and Contact Nozzle.

⚠ CAUTION

DO NOT HOLD THE WELDING WIRE WITH BARE HANDS WHILE INCHING DOWN
When Inching Down, a low voltage signal is applied to the weld wire to enable the Auto Stop Circuit.

5. **START Button** - Initiates the weld and travel functions.

6. **STOP Button** - Stops the weld process and travel.

7. **Upper Welding Control** - Controls the output of the power source. In **CC Mode**, it controls the **Current** and in **CV Mode** it controls the **Voltage.**

8. **Lower Welding Control** - Controls the Wire feed Speed. In **CC Mode** it controls the **Voltage** and in **CV Mode** it controls the **Current**.

9. **Nameplate** - There are two (2) nameplates provided. One for CC (VV) Operation as shown in Figure E.2, and one for CV operation (behind the VV nameplate)

NOTE: The CV nameplate labels the upper control as VOLTAGE, and the lower control as CURRENT. The functions of the controls are as indicated above.

Return to Section TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC

GENERAL INFORMATION

Once the LT-7 is configured properly for the type of weld to be done (i.e. fillet, butt, lap weld), the steering or 'tracking' is properly set and the control and weld cables properly connected, the unit is ready to weld. Before welding, the following decisions need to be made:

Weld Mode - Constant Current (CC) or Constant Voltage (CV).
- Dictated by the application and/or the power source being used.
- The LT-7 comes shipped ready to weld Constant Current (CC)
- See ***Mode Selection*** instructions to change to Constant Voltage (CV)

NOTE: Constant Current (CC) mode was formerly called Variable Voltage (VV).

Polarity - Positive or Negative
- Dictated by the application and/or weld products being used
- The LT-7 comes shipped connected for Positive (Reverse) polarity
- See ***Polarity Selection*** instructions for Negative (Straight) polarity

CONSTANT CURRENT VS. CONSTANT VOLTAGE

The LT-7 is capable of welding in the Constant Current (CC) mode or Constant Voltage (CV) Mode. If the power source being used is capable of either mode, the decision on which mode to use must be made before attempting to weld. The following information explains the difference between the two modes.

Constant Current (*Figure E.3*)

- Operator sets desired current and voltage.
  - The power source maintains a costant current output.
  - The LT-7 Variable Voltage Board monitors the Arc voltage and varies the wire feed speed above and below the set speed to compensate for voltage changes. It is normal for the voltage to fluctuate slightly.
  - The result is a constant arc length.

NOTE: The upper control of the LT-7 adjusts the power source output (current) and the lower control adjusts the wire feed speed. In the CC mode, wire speed has the greatest impact on Voltage although both current and voltage will change as the speed is varied due to the output characteristics of a CC power source.

Constant Voltage (*Figure E.4*)

- Operator sets desired current and voltage.
  - The power source maintains a costant voltage output by allowing the current to fluctuate, compensating for changes in the arc.
  - The LT-7 maintains a constant wire feed speed.
  - The result is a constant arc length.

NOTE: The upper control of the LT-7 adjusts the power source output (voltage) and the lower control adjusts the wire feed speed. In the CC (VV) mode, the wire speed determines the weld current. There should be little or no change in voltage as the speed is varied.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

Figure E.3 Constant Current

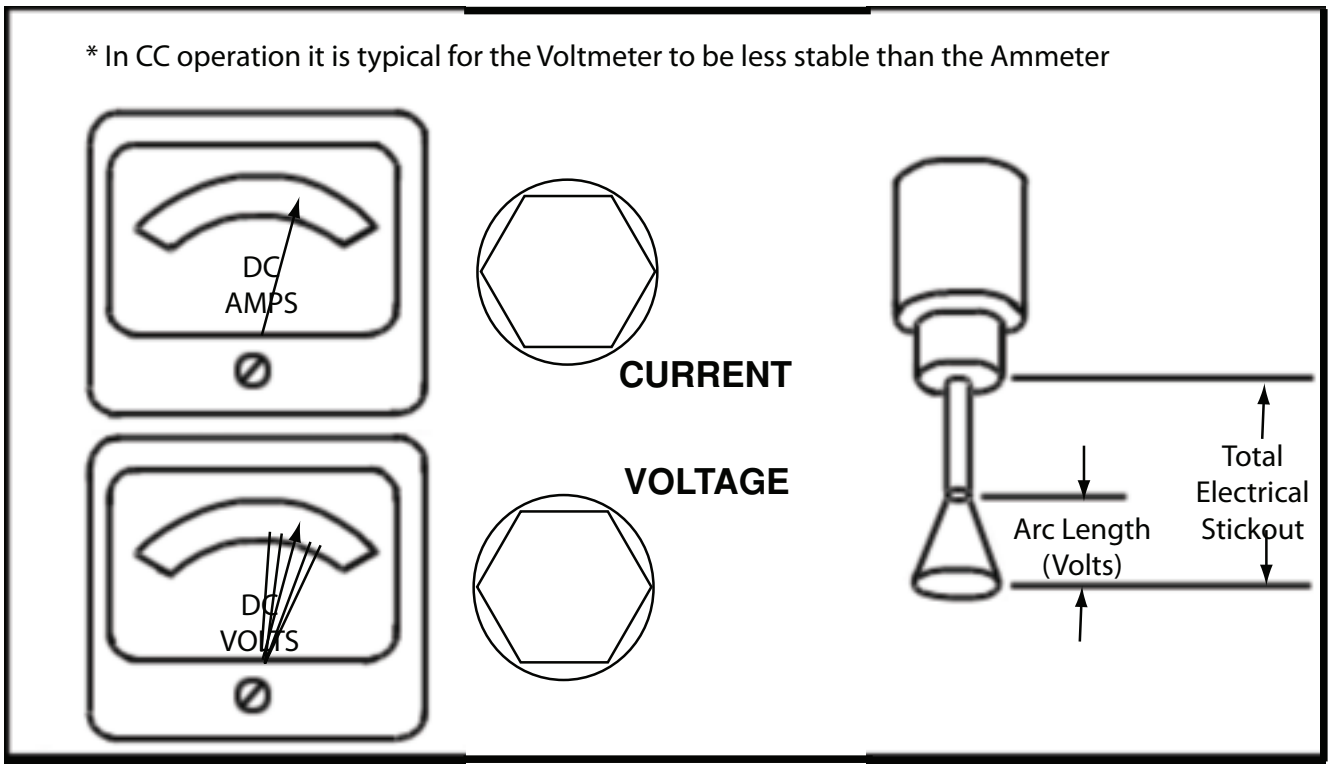
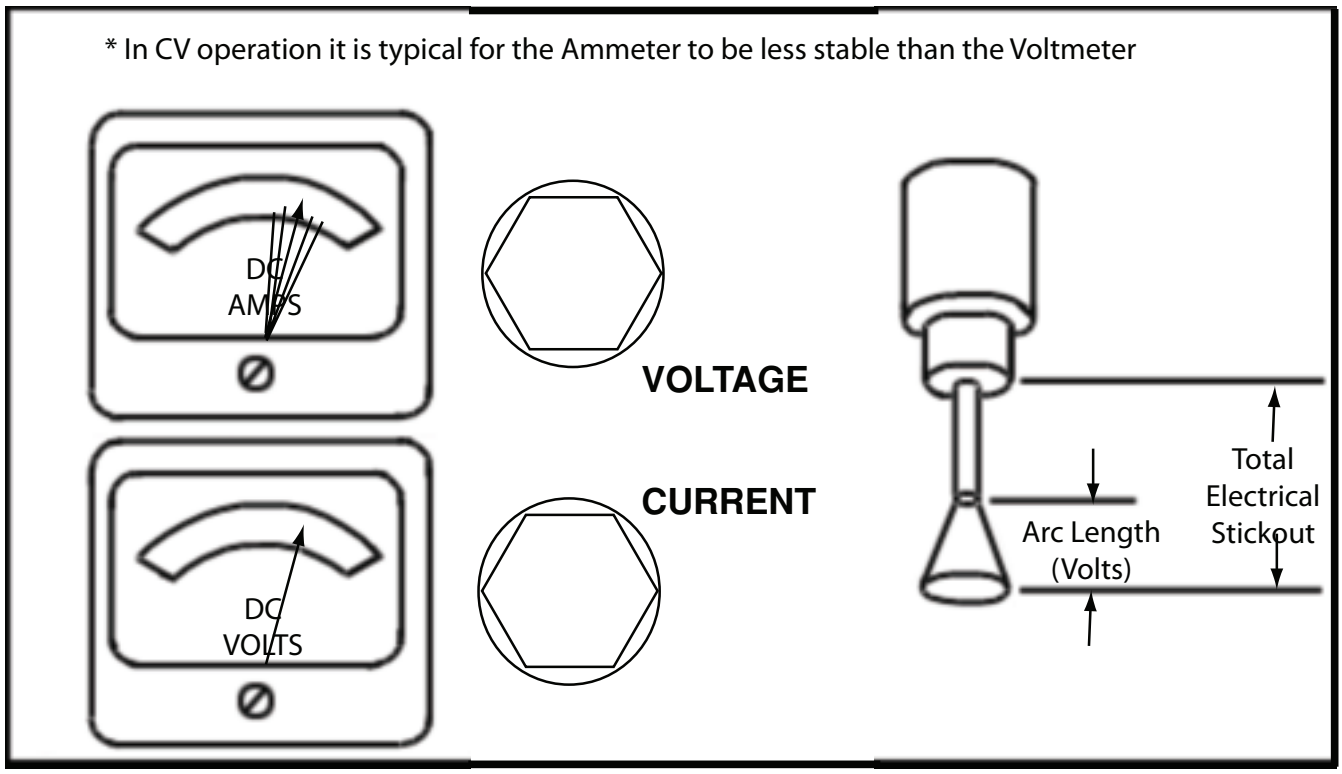


Figure E.4 Constant Voltage

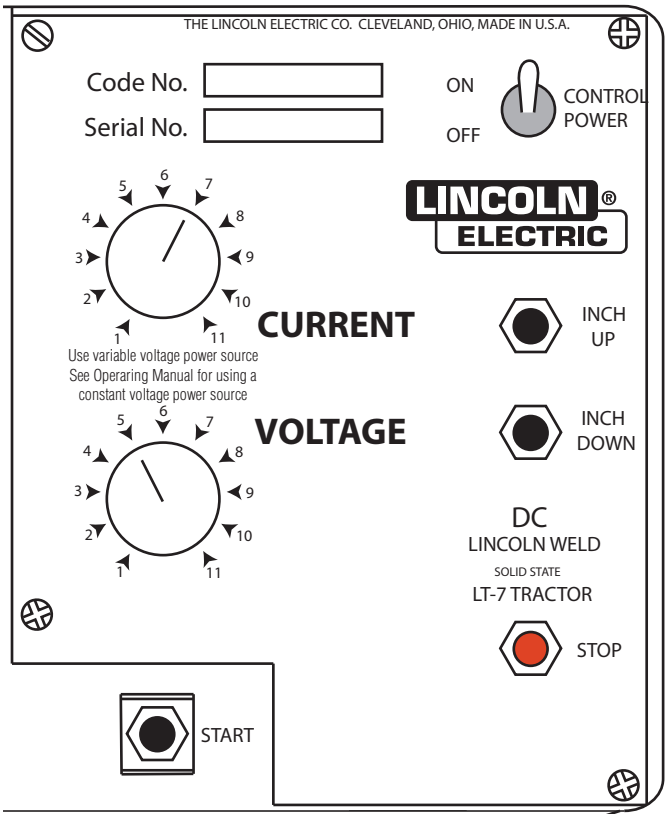


MODE SELECTION

The LT-7 is shipped, ready to weld in a Constant Current mode with the Variable Voltage nameplate visible. (See Figure E.5). If the constant current process is desired, be sure that multi process power sources are set in the Constant Current mode per the instructions in the power source operating manual.

NOTE: The term constant current (CC) was formerly known as variable voltage (VV). The LT-7 Nameplate and PC Board still use the Variable Voltage designation.

FIGURE E.5 - CC MODE



If a Constant Voltage power source is being used or the Constant Voltage process is desired it will be necessary to make the following changes.

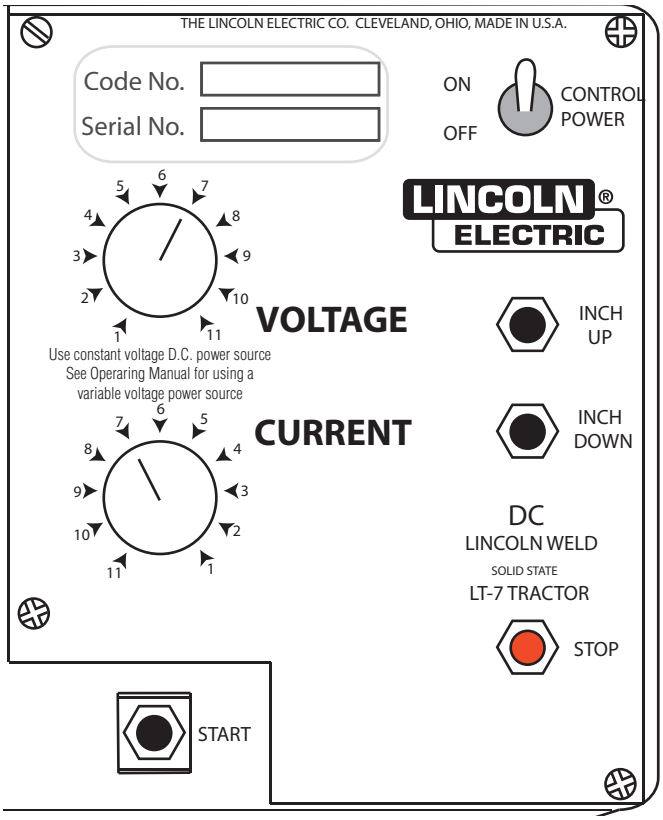
1. **Make certain that the Input power is turned OFF.**

2. Remove the four screws (3 phillips and 1 slotted) that hold the nameplates to the front panel of the Control Box.

3. Put the Constant Voltage nameplate on top of the Variable Voltage nameplate and put both name-plates back on the front panel with the three Phillips screws.

NOTE: The CV nameplate on newer machines has a black background with white lettering.

FIGURE E.6 - CV MODE



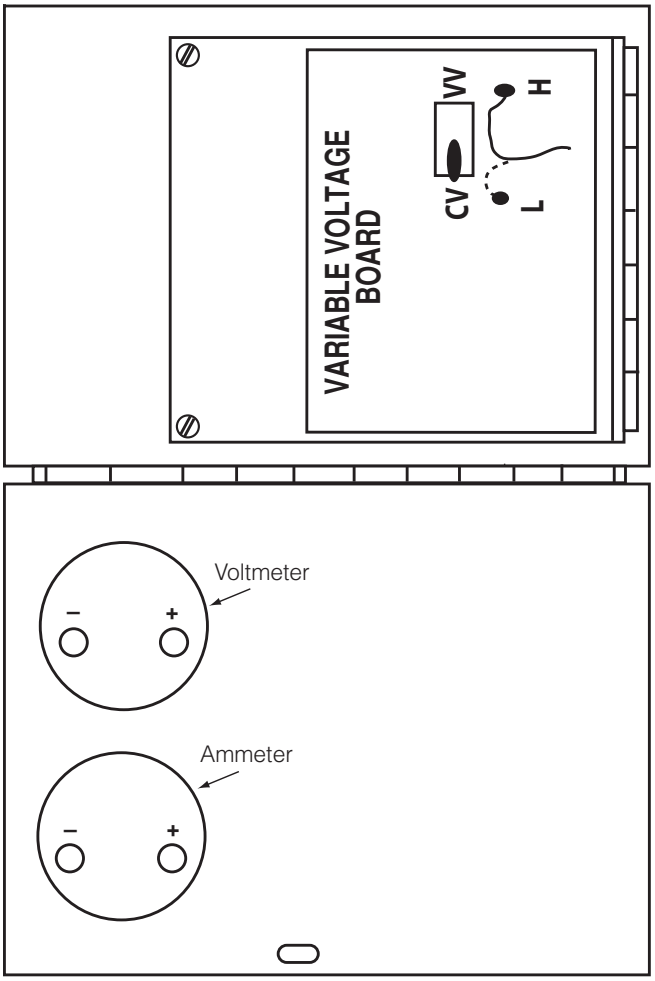
Return to Section TOC
Return to Master TOC

4. Lower the front panel and change the toggle switch on the Variable Voltage board to the “CV” position. See Figure E.7.

NOTE: If using a power source with a low output impedance (< 500 ohms), move the jumper lead on the VV Board to the “L” pin. This disables the ‘Auotmatic Stop’ feature. The wire will not stop when it touches the work while inching down. Also, it will be necessary to start the weld with the electrode NOT touching the work.

5. Close the front panel, being careful not to pinch any leads, and replace the slotted head screw.

FIGURE E.7 - MODE/POLARITY CHANGE



POLARITY SELECTION

The LT-7 is shipped ready to weld in **Positive (Reverse) Polarity** which is correct for most submerged arc welding.

If a particular application requires **Negative (Straight) Polarity** it will be necessary make the following changes:

1. **Make certain that the power source is turned OFF.**

2. Reverse the weld cables (Electrode and Work) at the output studs of the power source

3. Remove the slotted head screw at the upper left corner of the nameplate and drop the front panel down.

4. Reverse the connections on the Ammeter so that;

   Lead #67 is on the Negative (**-**) stud
   Lead #517 is on the Positive (**+**) stud.

5. Reverse the connections on the Voltmeter so that;

   The #67 leads(2) are on the Negative (**-**) stud
   The #21 leads(2) are on the Positive (**+**) stud.

NOTE: Be certain connections are snug, but be careful not to overtighten to avoid damaging the meters.

6. Close the front panel, being careful not to pinch any leads, and replace the slotted head screw.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

MAKING A WELD

Once the LT-7 is configured properly for the type of weld to be done (i.e. fillet, butt, lap weld), the steering or 'tracking' is properly set, the control and weld cables properly connected, and the proper Weld Mode and Polarity are selected the unit is ready to weld.

1. Load the wire reel and flux hopper. All re-used flux must be screened 100% through a screen with 3/32" (2.4 mm) maximum openings (8 mesh).
2. Place the tractor on the joint. Adjust the head for the proper electrial stickout (E.S.O.).
3. Set the travel switch to "Automatic Travel" , set the "Direction of Travel" to "Forward" and engage the Clutch Mechanism.
4. Set the travel speed, welding current and arc voltage as required by the procedures.

   If the Current and Voltage settings have not been previously established, set the Current Control to about #4 and the Voltage Control to about #7.
5. Feed the wire through the nylon conduit and into the wire straightener.
6. Use the INCH DOWN button to feed the wire through the drive rolls and the contact nozzle.

⚠ CAUTION

DO NOT HOLD THE WELDING WIRE WITH BARE HANDS WHILE INCHING DOWN
When Inching Down, a low voltage signal is applied to the weld wire to enable the Auto Stop Circuit

7. Cut the end of the electrode to a sharp point.
   a. For 'Cold Starting' at a precise location, inch the electrode down until it touches the work and stops automatically.

   NOTE: If the Variable Voltage Board jumper is required to be on the "L" pin, the wire will not stop when it touches the work. It will be necessary to use 'hot starting'.

   b. For hot starting, feed the electrode to approximately 1/8" above the work piece. Cut electrode to a sharp point before each weld.
8. Open the manual flux valve.
9. Press the "START" button to start the wire feed and tractor drive motors.
10. While welding, adjust the LT-7 "Voltage" and "Current" settings for the proper weld procedure. Also adjust the flux flow valve to deposit just enough flux to prevent excessive visible "flash through".
11. At the end of the weld, press the "STOP" button to stop the wire feed and tractor drive motors. For a fixed time delay (~ .3 sec.) the welder output will remain on to prevent the electrode from sticking in the puddle
12. Turn the flux valve off.

FIGURE E.8

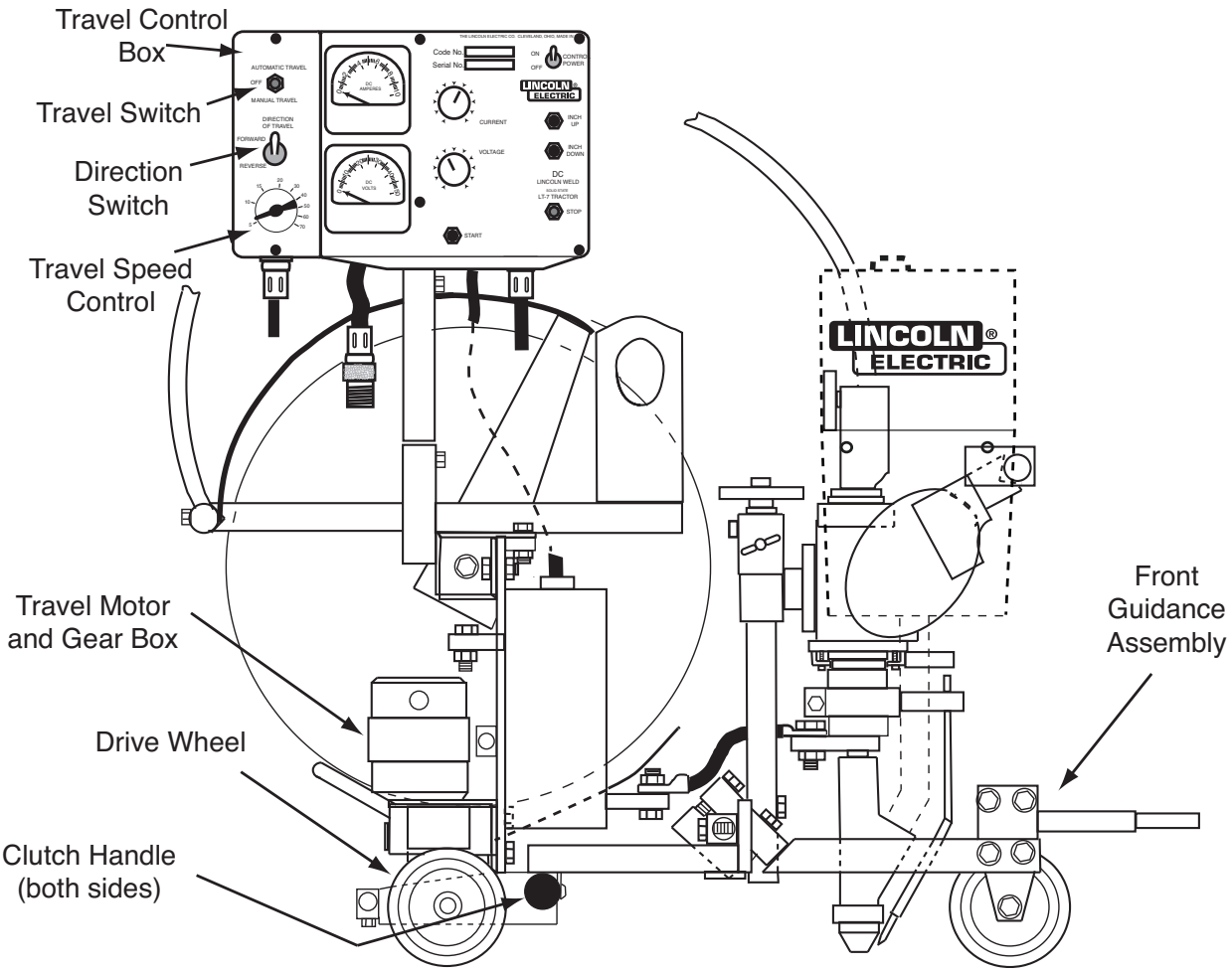
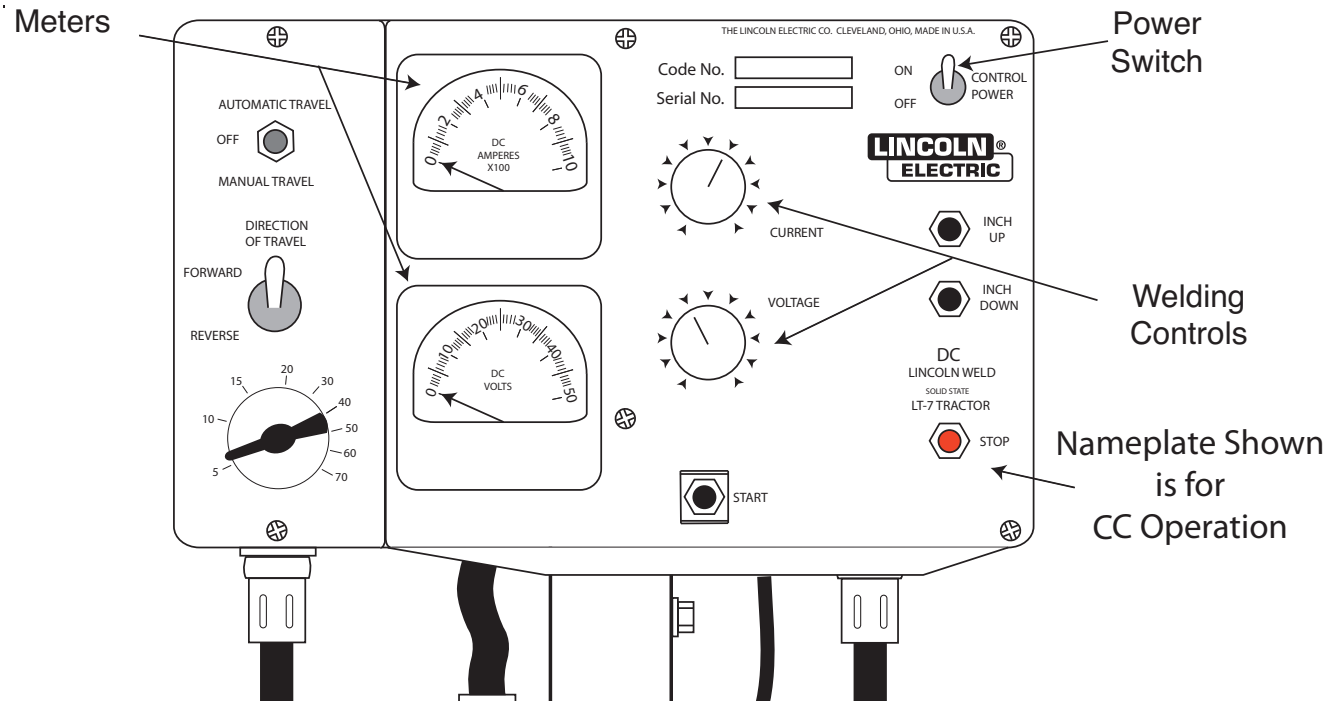


FIGURE E.9



LT-7 TRACTOR

LINCOLN ELECTRIC

Return to Section TOC
Return to Master TOC

NOTES

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

TABLE OF CONTENTS-THEORY OF OPERATION SECTION

Return to Master TOC

Return to Master TOC

Return to Master TOC

FIGURE F.1 BLOCK LOGIC DIAGRAM

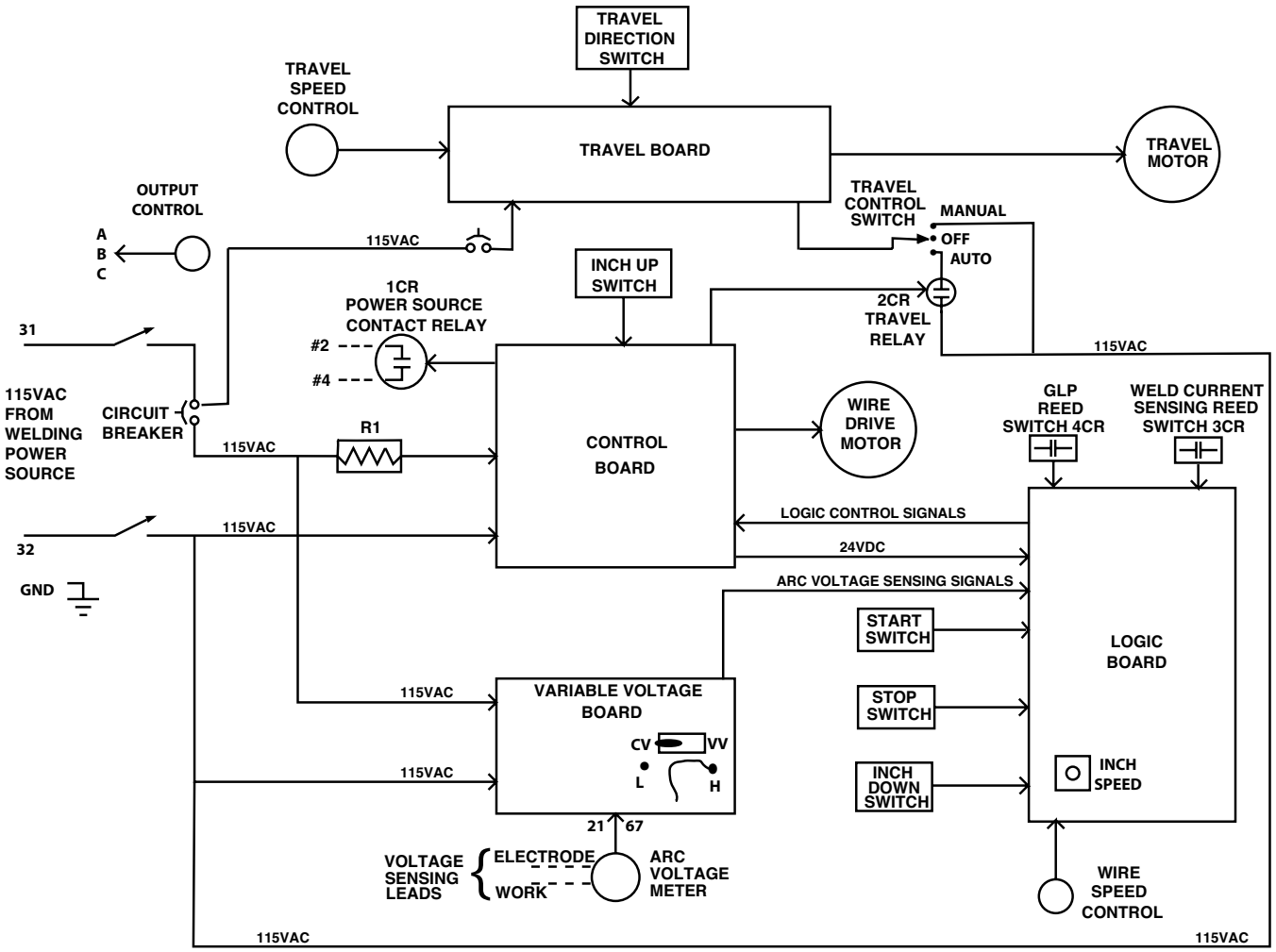
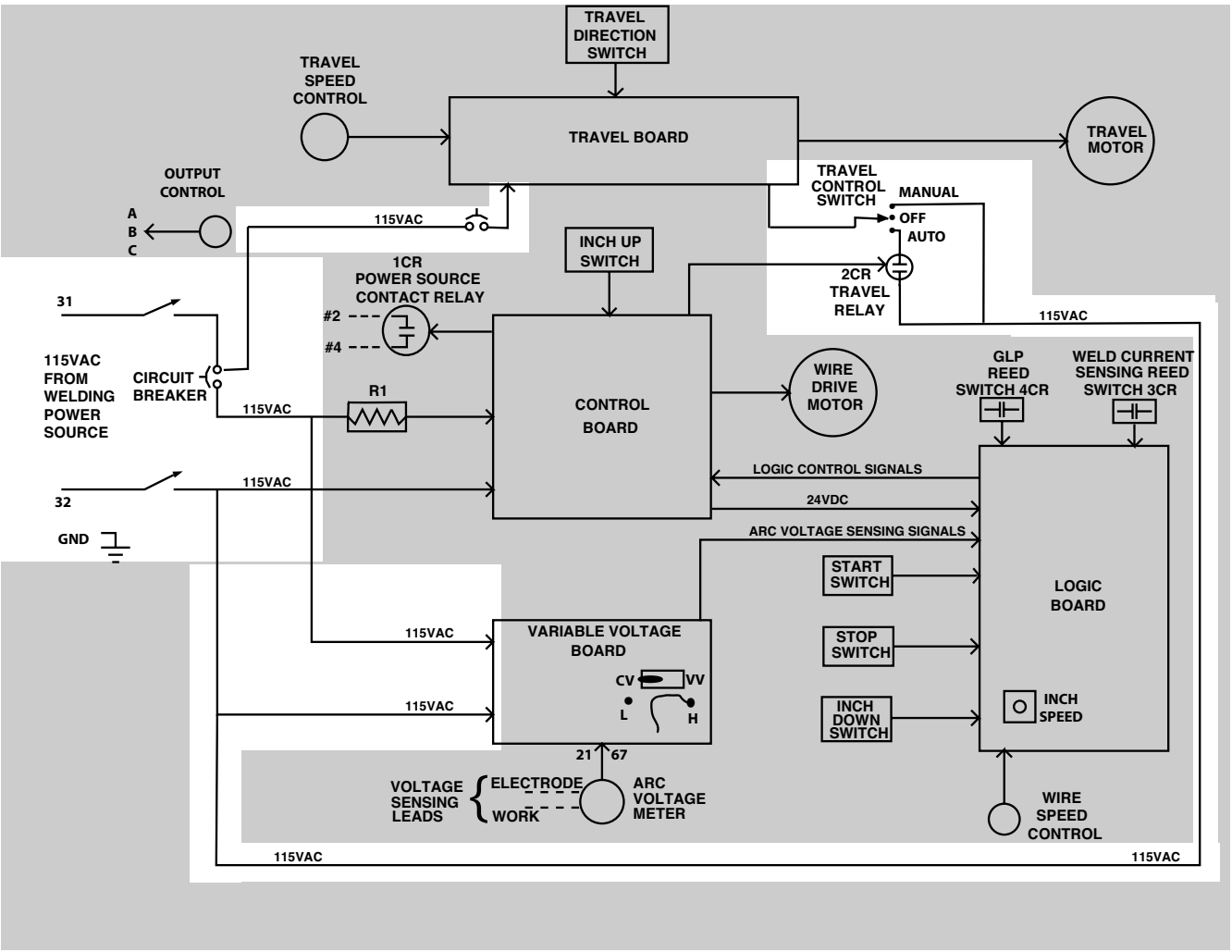


FIGURE F.2 - INPUT POWER CIRCUIT



GENERAL DESCRIPTION

The LT-7 tractor is a compact, lightweight, DC, single arc tractor. It is capable of operating with 3/32" through 3/16" electrode with a current carrying capacity of 1000 amps. The LT-7 has a travel range from 6 to 70 inches per minute.

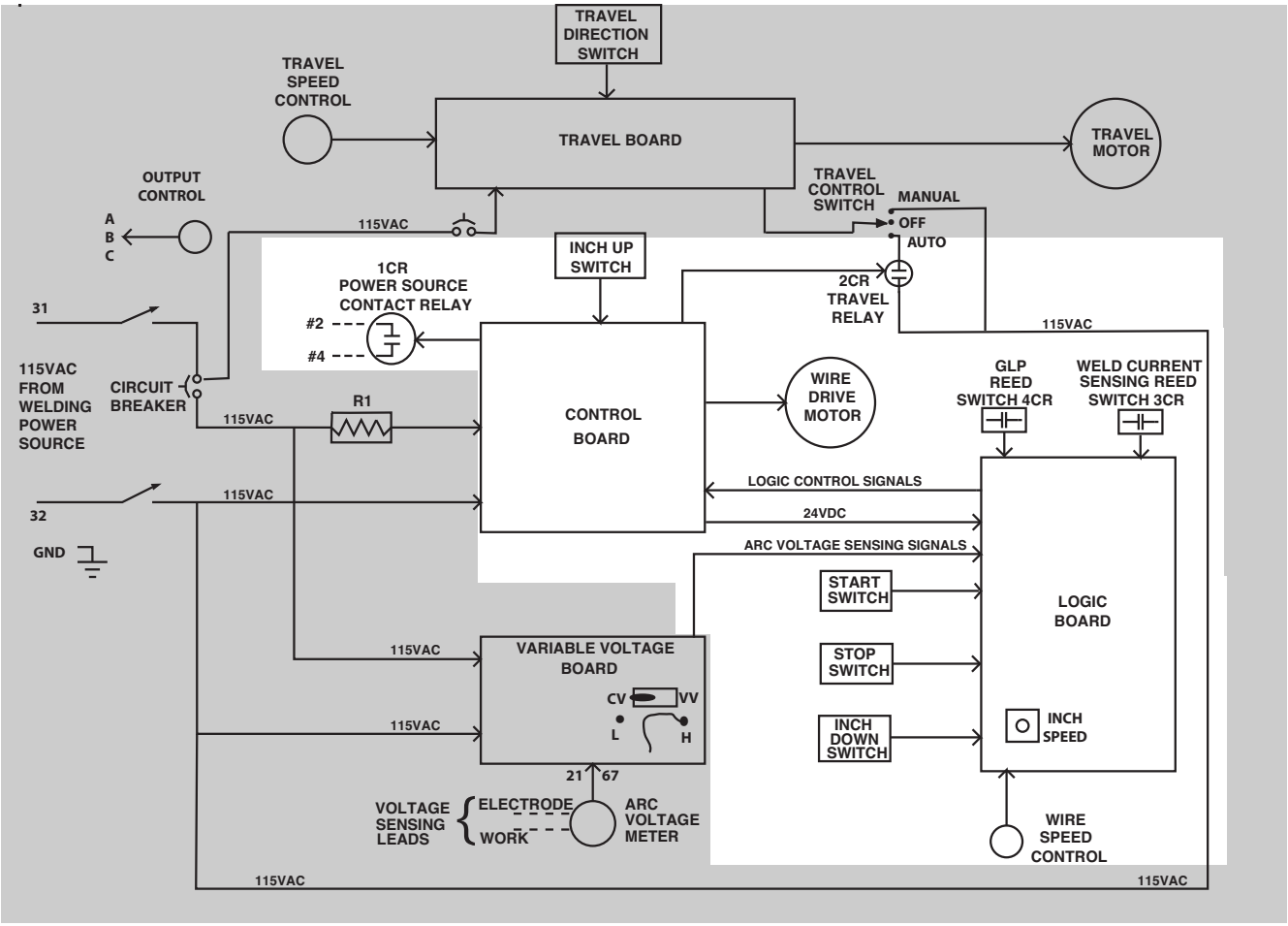
INPUT POWER CIRCUITS

The LT-7 is powered by 120VAC which is usually supplied from the welding power source. This voltage is applied to the control box circuitry through the ON/OFF power switch and a 3 Amp circuit breaker. The input power is also applied to the the Variable Voltage Board and, through resistor R1, to the Control Board.

The 120VAC is also applied to the Travel Control Box. The Travel Control Box has a .8 Amp circuit breaker to protect the travel circuitry.

NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion

FIGURE F.3 - CONTROL AND LOGIC CIRCUITS



CONTROL AND LOGIC CIRCUITS

In general, the control board houses two SCR-controlled 120 VDC power supplies that power the field and armature circuits of the wire drive motor. ***(See SCR Operation)*** in this section. The motor field is at a constant 120vdc. The polarity is reversed to change direction. The armature voltage varies from 5 to 90 vdc in response to the control circuitry. The Control Board also has a regulated 24 VDC control circuit power supply that is used by all but the Travel Circuits.

The logic board incorporates a 15 VDC regulated supply, which is derived from the 24 VDC received from the control board. The logic board interprets and processes the signals received from the various switches and controls.

Upon receiving commands from the user-operated switches or potentiometers, the logic board sends the appropriate signal to the control board. The Control board then drives the wire feed motor at the correct speed and in the proper direction.

The "START" switch signals the logic board to start the wire feed, activate the power source contact relay (1CR) and the travel relay (2CR). When the weld current is established the reed switch (4CR) closes and the logic board directs the control board to change the wire drive motor from the preset inching speed to the welding feed speed set by the wire speed (lower) control potentiometer.

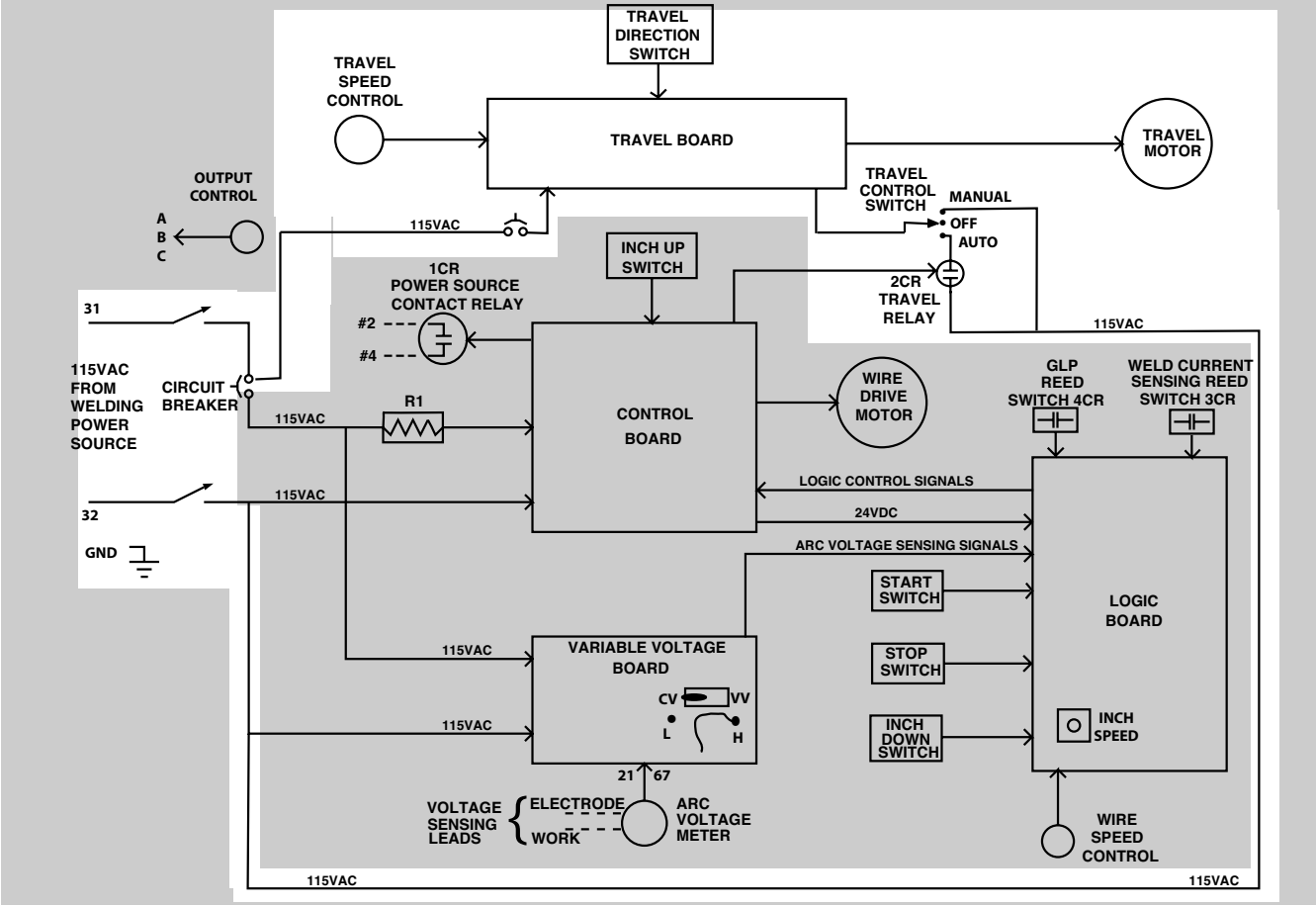
The "INCH DOWN" switch signals the logic board, sending the appropriate command to the control board, which drives the wire drive motor in the proper direction at the speed determined by the INCH speed trimmer on the Logic Board.

The "INCH UP" switch, which is connected directly to the control board, is used to back the electrode wire away from the work piece or to remove the wire from the head. Inch up speed is also determined by the INCH speed trimmer.

The "STOP" switch signals the Locic Board to shut down the wire feed, the travel and after a short time delay (~ .3 sec.), the power source output.

NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion

FIGURE F.4 - TRAVEL CIRCUITS



TRAVEL CIRCUIT

The Travel Circuit receives 120vac power directly from the ON/Off siwtch. One leg of the power is applied through the .8 Amp circuit breaker in the Travel Control Box. The other side is applied by way of the Travel Control Switch, either directly for “Manual” travel or through the 2CR relay contact for “Automatic” travel when the START button is activated.

The Travel Control Board contains an SCR circuit to provide armature voltage of about 5 to 90 vdc to the Travel Motor.***(See SCR Operation)*** in this section. The speed is derternined by the Travel Speed Control. The nameplate on the Travel Control Box is calibrated in inches/min.

The Travel Direction Switch allows for forward or reverse movement. With proper alignment of the weld head, welding may be done in either direction. Tracking in the reverse direction is considerably easier when using the K395 Track Model LT-7.

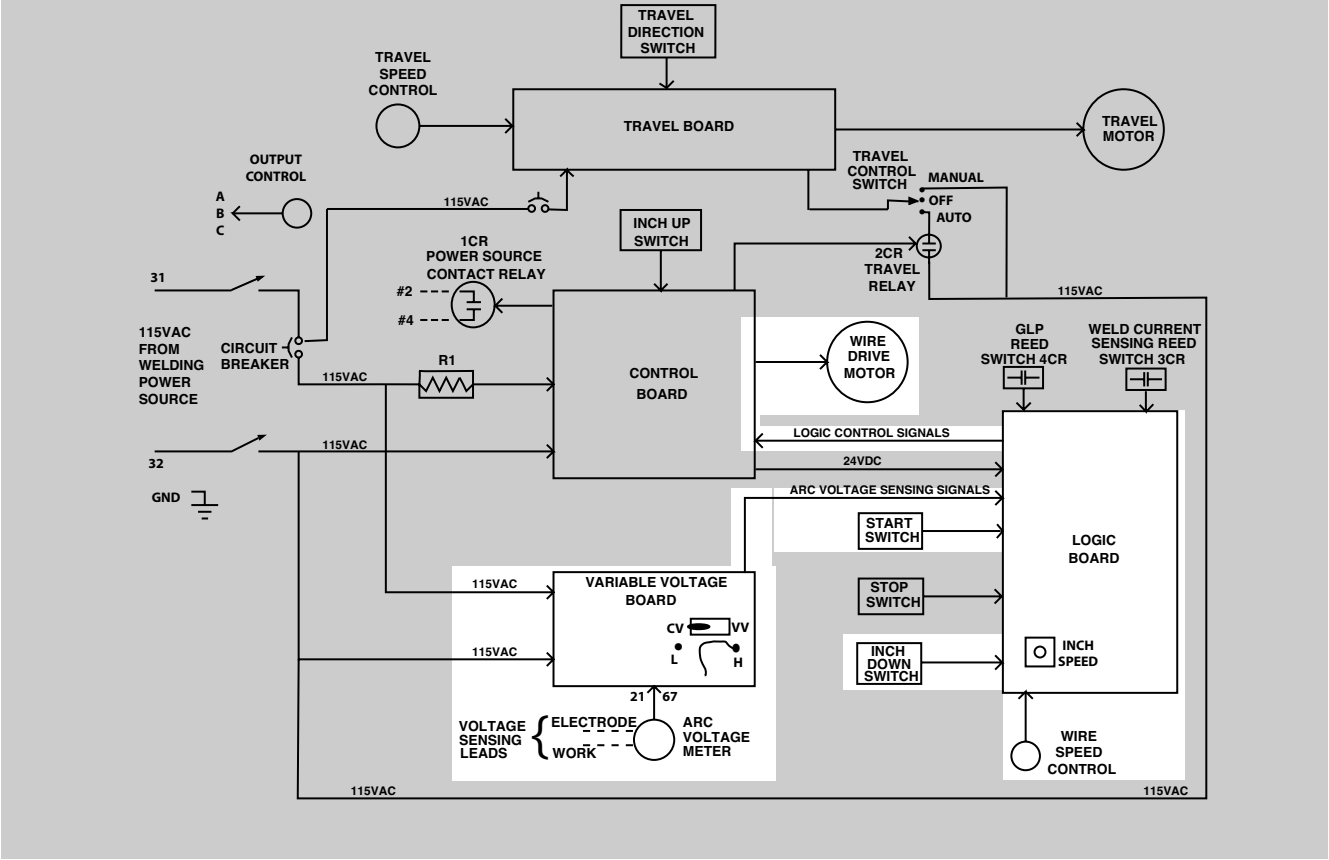
Older LT-7 units had a shunt wound motor which required a 120vdc power supply to the motor field circuit. This supply was also located on the Travel Control Board and the polarity was switched by the Direction Switch.

That motor was replaced by the current ‘permanent magnet’ motor. In the newer units, the direction is changed by reversing the polarity of the voltage to the armature.

Wiring diagrams for both versions of the travel circuit are in the ***Section J*** of this manual.

NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion

FIGURE F-5 - VARIABLE VOLTAGE CIRCUIT



VARIABLE VOLTAGE CIRCUIT

Arc voltage is monitored by the voltmeter and the Variable Voltage Board. When the LT-7 is being operated in the constant current (VV) mode, the variable voltage board is essential in the control of the wire feed speed.

As the arc length changes, the arc voltage will also change. The variable voltage board recognizes this change and signals the logic board to change the wire feed speed signal to the Control Board in the same direction as the arc voltage. For example, if the arc volts increases indicating that the arc is getting longer, the speed is increased to reduce the arc length. This 'modulation' of the speed allows the LT-7 to maintain a constant arc length and produce a stable, high quality weld.

The Variable Voltage Board also contains the "Auto-Stop Circuit" which allows for "cold starting" This circuit is active when the VV Boad jumper is on the "H" pin. When the INCH DOWN is pressed, a low voltage (approx. 24volts) is applied to the work and electrode circuit. The Logic responds to the 'voltage present' and allows the wire to feed forward.

When the electrode makes contact with the work piece, this low voltage is shorted out (0 volts), signaling the logic circuitry to stop the wire feed.

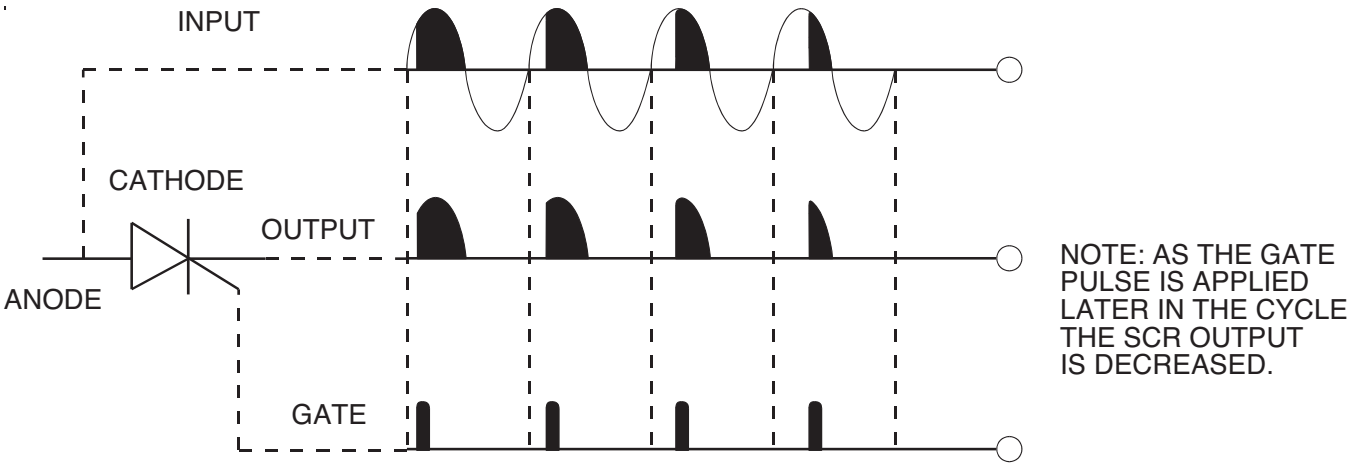
When the START button is pressed the wire will not feed down until the VV Board senses that at least 8 volts of arc voltage is present. This slight delay prevents the wire from driving into the work piece and provides a clean start.

NOTE: If arc voltage is not forthcoming due to a fault in the system, the wire will reverse when the START button is pressed. If this occurs, see the ***Troubleshooting Section*** of this manual for possible solutions.

Some power sources (i.e. DC- 400, CV-400, CV-655, Vantage 500) will not allow the LT-7 to INCH down due to their low output impedance. With these welders the VV Board jumper must be placed on the "L" terminal and the "hot starting" techniques must be used. See ***Making a Weld*** in the Operation Section of this manual.

NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion

FIGURE F.5 – SILICON-CONTROLLED RECTIFIER OPERATION.



SCR OPERATION

The wire speed and the travel speed of the LT-7 is controlled by silicon-controlled rectifier (SCR) circuitry, so a basic understanding of how an SCR functions is important.

An SCR is a three-terminal semiconductor device used to control currents to a load. An SCR acts very much like a switch. When a gate signal is applied to the SCR, it is 'turned on' and there is current flow from anode to cathode. In the on state, the SCR acts like a closed switch. When the SCR is turned off, there is no current flow. As the name suggests, the SCR is a rectifier, so it passes current only during positive half cycles of the AC supply. The positive half cycle is the portion of the sine wave in which the anode of the SCR is more positive than the cathode.

When an AC supply is applied to the SCR, the device spends a certain portion of the AC cycle time in the on state and the remainder of the time in the off state. The amount of time spent in the on state is controlled by a 'firing' signal applied to the gate.

The firing signal consists of a short burst of current into the gate that is positive with respect to the cathode. Since there is a standard 'PN' junction between the gate and cathode, the gate voltage must be slightly greater than 0.6 VDC. Once the SCR has fired, it is not necessary to continue the flow of the gate current. As long as the current continues to flow from anode to cathode, the SCR will remain on. When the anode to cathode current drops below a minimum value, called the holding current, the SCR will shut off. This normally occurs as the AC supply voltage passes through zero into the negative portion of the sine wave.

If the SCR is turned on early in the positive half cycle, the conduction time is longer, resulting in greater SCR output. If the gate firing time is later in the cycle, the conduction time is less, resulting in lower SCR output. See Figure F.5.

Full wave rectification requires two SCR's - one for each half cycle of the rectified sine wave.

Return to Section TOC
Return to Master TOC

TABLE OF CONTENTS - MAINTENANCE SECTION

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

Routine Maintenance

⚠ CAUTION

- If for any reason a user does not understand the test procedures or is unable to perform the tests/repairs safely, contact a local authorized Lincoln Electric Field Service Facility for technical assistance.
- Observe all safety guidelines detailed in the beginning and throughout this manual.

⚠ WARNING

ELECTRIC SHOCK can kill.

- Have an electrician install and service this equipment.

- Turn the input power off at the fuse box before working on equipment.
- Do not touch electrically hot parts.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

WIRE FEED HEAD

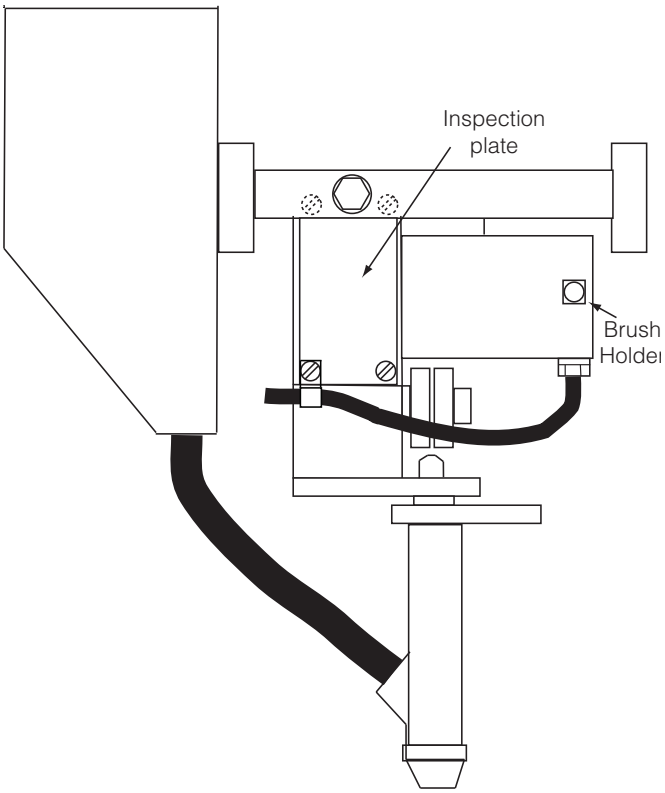
Wire Drive Motor And Gear Box

Inspect the gear box annually.

1. Remove the four (4) slotted head screws that hold the inspection plate. See Figure G.1
2. Coat the teeth of the motor pinion gear and the helical gears with graphite grease. The grease can be scooped from the inside of the gearbox and redeposited on the gears.
3. Replace the Inspection Plate.

Every six months check the motor brushes. Replace them if they are less than 1/4" (6.4 mm) long.

FIGURE G.1 FEED HEAD

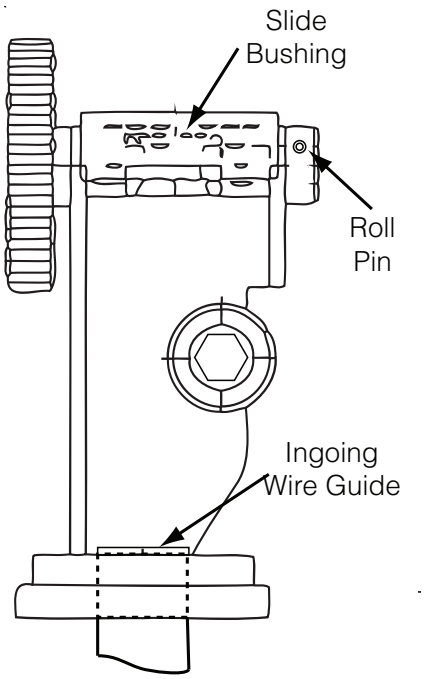


Drive Rolls and Guide Tubes

Periodically inspect the drive roll section for excessive wear. Clean it as necessary. Do not use solvents for cleaning the idle roll because it may wash the lubricant out of the bearing. The drive rolls, and guide tubes are stamped with the wire sizes they will feed.

The drive rolls have a double set of teeth so they can be reversed for additional life

FIGURE G.2 WIRE STRAIGHTENER



Wire Straightener

Periodically inspect the slide bushing at the top of the straightener and the ingoing wire guide at the bottom of the straightener for signs of wire milling. If necessary, rotate the ingoing guide to present an unworn surface. To reverse the slide bushing for a fresh wear surface:

1. Use 1/16" punch to drive the roll pin out of the screw bushing and remove the bushing.
2. Remove the slide screw assembly and turn the slide bushing over.
3. Replace the slide screw assembly and reinstall the screw bushing and the roll pin.

Return to Section TOC
Return to Master TOC

Contact Nozzle Assembly

The nozzle contact tip must be replaced when it is no longer provides accurate wire location or good electrical contract. See the appropriate contact nozzle information (K231 or K148) in ***Section C*** of this manual for further information.

Wire Reel Mounting – 50 and 60 Pound Coils

To prolong the life of the reel shaft, periodically coat it with a thin layer of grease.

Control Box

The Control Box requires no routine maintenance except to occasionally remove dirt by blowing with low pressure dry air.

Travel Components

The tractor drive motor gear box requires no routine maintenance except to check the motor brushes every six months. Replace them if they are less than 1/4" (6.4 mm) long.

For proper clutch operation, occasionally lubricate the gear and sliding surfaces of the rear axle with a dry lubricant, such as moly disulfide powder.

Circuit Protection

The AC input line is protected by the circuit breaker mounted between the LT-7 meters. It protects LT-7 from shorts and from overloads, usually caused by excessive wire drag or other wire feeding problems. To reset the circuit breaker, push the red button. If it opens again, determine the cause of the overload. The LT-7 light outlet is not protected by the circuit breaker.

In earlier models, if a short occurs in the field circuit of either the wire feed or travel motors, or if there is a defect on the P.C. board, a 1/2 amp slow-blow type fuse will blow. This field circuit fuse is mounted on the control P.C. board inside the respective weld or travel control box. Before replacing the fuse, check the motor field for a shorted condition.

In earlier models, if a P.C board component fails and overloads the 24 volt DC power supply to the control circuit, the 2/10 amp fuse on the control P.C board inside the control box will blow.

NOTE: The LT-7 (earlier models only) is shipped with spare fuses taped to the left side of the control box inside. On the later models all fuses on the control board have been replaced with PTC's (self resetting fuses). These devices will shutdown the circuit if overloaded, but will automatically reset after the overload condition has been removed. Should one or these devices trip, turn off the power to the unit and remove the source of the overload (See the ***Troubleshooting Guide*** for possible reasons for fuse blowing). Allow a few minutes for the device to cool down before restoring power.

Grounding Lead Protector

The frame of the LT-7 is grounded to the frame of the power source by a lead in the control cable. An overload protector prevents welding current from damaging this lead if the electrode circuit comes in contact with the LT-7 frame or the control housing. If this occurs the Grounding Lead Protector (GLP) circuit will shut down the welding operation. The machine cannot be restarted until the fault is cleared and the GLP circuit is reset as follows:

1. Turn the LT-7 Power Switch OFF.
2. Clear the fault by eliminating the source of electrode to frame contact.
3. Turn the LT-7 Power Switch back on.
4. If the fault was cleared succesfully, the unit is ready for operation.

Nuisance GLP Circuit tripping when there is no actual ground fault can be caused by the following conditions:

- If the work piece is common with earth ground and the LT-7 frame is common with the work because of uninsulated guide rollers, some current will be shared by the safety ground lead. If this current becomes excessive due to poor connections or undersized work cables, the GLP circuit may activate. Repair the connections or add parallel work cables.
- Coiled up control cables bundled with weld cables can also cause GLP tripping due to high weld current surges. Straighten the cables and /or separate the control cable from the weld cables.

TABLE OF CONTENTS - TROUBLESHOOTING AND REPAIR

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

HOW TO USE TROUBLESHOOTING GUIDE

⚠ WARNING

Service and Repair should only be performed by Lincoln Electric Factory Trained Personnel. Unauthorized repairs performed on this equipment may result in danger to the technician and machine operator and will invalidate your factory warranty. For your safety and to avoid Electrical Shock, please observe all safety notes and precautions detailed throughout this manual.

This Troubleshooting Guide is provided to help you locate and repair possible machine malfunctions. Simply follow the three-step procedure listed below.

Step 1. LOCATE PROBLEM (SYMPTOM).
Look under the column labeled "PROBLEM (SYMPTOMS)". This column describes possible symptoms that the machine may exhibit. Find the listing that best describes the symptom that the machine is exhibiting. Symptoms are grouped into the following categories: output problems, function problems, wire feeding problems, and welding problems.

Step 2. PERFORM EXTERNAL TESTS.
The second column labeled "POSSIBLE AREAS OF MISADJUSTMENT(S)" lists the obvious external possibilities that may contribute to the machine symptom. Perform these tests/checks in the order listed. In general, these tests can be conducted without removing the case wrap-around cover.

Step 3. RECOMMENDED COURSE OF ACTION
The last column labeled "Recommended Course of Action" lists the most likely components that may have failed in your machine. It also specifies the appropriate test procedure to verify that the subject component is either good or bad. If there are a number of possible components, check the components in the order listed to eliminate one possibility at a time until you locate the cause of your problem.

All of the referenced test procedures referred to in the Troubleshooting Guide are described in detail at the end of this chapter. Refer to the Troubleshooting and Repair Table of Contents to locate each specific Test Procedure. All of the specified test points, components, terminal strips, etc. can be found on the referenced electrical wiring diagrams and schematics. Refer to the Electrical Diagrams Section Table of Contents to locate the appropriate diagram.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

PC BOARD TROUBLESHOOTING PROCEDURES

⚠ WARNING

ELECTRIC SHOCK can kill.

- Have an electrician install and service this equipment. Turn the input power OFF at the fuse box before working on equipment. Do not touch electrically hot parts.

⚠ CAUTION

Sometimes machine failures appear to be due to PC board failures. These problems can sometimes be traced to poor electrical connections. To avoid problems when troubleshooting and replacing PC boards, please use the following procedure:

1. Determine to the best of your technical ability that the PC board is the most likely component causing the failure symptom.
2. Check for loose connections at the PC board to assure that the PC board is properly connected.
3. If the problem persists, replace the suspect PC board using standard practices to avoid static electrical damage and electrical shock. Read the warning inside the static resistant bag and perform the following procedures:

PC board can be damaged by static electricity.

ATTENTION Static-Sensitive Devices Handle only at Static-Safe Workstations

- Remove your body's static charge before opening the static-shielding bag. Wear an anti-static wrist strap. For safety, use a 1 Meg ohm resistive cord connected to a grounded part of the equipment frame.

- If you don't have a wrist strap, touch an un-painted, grounded, part of the equipment frame. Keep touching the frame to prevent static build-up. Be sure not to touch any electrically live parts at the same time.

- Tools which come in contact with the PC board must be either conductive, anti-static or static-dissipative.

- Remove the PC board from the static-shielding bag and place it directly into the equipment. Don't set the PC board on or near paper, plastic or cloth which could have a static charge. If the PC board can't be installed immediately, put it back in the static-shielding bag.

- If the PC board uses protective shorting jumpers, don't remove them until installation is complete.

- If you return a PC board to The Lincoln Electric Company for credit, it must be in the static-shielding bag. This will prevent further damage and allow proper failure analysis.

4. Test the machine to determine if the failure symptom has been corrected by the replacement PC board.

NOTE: It is desirable to have a spare (known good) PC board available for PC board troubleshooting.

NOTE: Allow the machine to heat up so that all electrical components can reach their operating temperature.

5. Remove the replacement PC board and substitute it with the original PC board to recreate the original problem.
   a. If the original problem does not reappear by substituting the original board, then the PC board was not the problem. Continue to look for bad connections in the control wiring harness, junction blocks, and terminal strips.
   b. If the original problem is recreated by the substitution of the original board, then the PC board was the problem. Reinstall the replacement PC board and test the machine.
6. Always indicate that this procedure was followed when warranty reports are to be submitted.

NOTE: Following this procedure and writing on the warranty report, "INSTALLED AND SWITCHED PC BOARDS TO VERIFY PROBLEM," will help avoid denial of legitimate PC board warranty claims.

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
Wire feeds whenever "Power Switch" (S1) is turned "ON".	1. Check the "Start Switch"(S5). Make certain it is not stuck closed. 2. Check the "Inch Down Switch" (S4). Make certain it is not stuck closed. 3. Check the "Inch Up Switch" (S3). Make certain it is not stuck closed.	1. If LED 1B on the Control Board is OFF the Control Board may be faulty. Replace. 2. If LED 1A is ON then remove lead #593 from the Inch Up switch(S3). If the problem is resolved the lead or the switch is faulty. If LED 1A stays ON when lead #593 is removed from the Inch Up switch the Control Board may be faulty. Replace. 3. If lLED 1B, on the Control Board, and LED 2B on the Logic Board, are both ON then remove lead #581 from the Start Switch(S5). If the problem is resolved the lead is grounded or the switch is faulty. If LED 2B stays ON when lead #581 is removed from the Start Switch the Logic Board may be faulty. Replace. 4. If LED 1B, on the Control Board, and LED 2J on the Logic Board are both ON then remove lead #592 from the Inch Down switch (S4). If the problem is resolved the lead is grounded or the switch is faulty. If LED 2J stays ON when lead #592 is removed from the Inch Down switch the Logic Board may be faulty. Replace.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

Return to Section TOC
Return to Master TOC

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
LT-7 is dead - No wire feed with INCH buttons and no travel, wire feed or welder output with START button.	1. Make sure the Power Switch (S1) is on and functioning properly. 2. Check the circuit breaker located on the front cover. If tripped - reset. If circuit breaker repeatedly trips during operation consult the appropriate "PROBLEMS (SYMPTOMS)" portion of this guide. 3. Open the front cover and inner panel to check if any of the LEDs on the printed circuit boards are lit. See the ***PC Board Status Light Table***. If none of the LEDs are lit, the control circiut is NOT receiving any power. Check the 2/10 amp fuse on the Control Board. Also make sure that 115VAC is present on leads #631 and #532. Check R1. See the ***Wiring Diagram***.	1. Check LEDs 1C and 1D on the Control Board. If both LEDs are ON at the same time replace the Control Board. 2. Press the inch up switch. LEDs 1D and 1E, on the Control Board should be ON. If either one is OFF the Control Board may be faulty. 3. If LED 1D and 1E are ON and the wire drive motor does not turn check the continuity of leads #539, #541, #626 and #627 from the Control Board to the wire drive motor. 4. Perform the ***Wire Drive Motor Test***.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

Return to Section TOC
Return to Master TOC

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The wire will not feed and the circuit breaker trips when the Inch or Start switches are pressed.	1. Reset the circuit breaker and observe LEDs 1C and 1D on the Control Board with the unit at idle (not attempting to feed wire). LED 1C should be OFF and LED 1D should be ON. If both LEDs are OFF remove power and check the 1/2 amp field fuse (F101) if present. (On newer boards the field fuse was replaced with a PTC self resetting fuse). 2. If both LEDs are ON the Control Board may be faulty. 3. The following conditions may cause the F101 fuse to fail. • Faulty wire drive motor • Incorrect welding procedure. • A low impedance across the arc voltage sensing leads (#21 and #67). • A defective Control Board.	1. If when at idle LED 1D is ON and LED 1C is OFF then perform the ***Wire Drive Motor Test***.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

Return to Section TOC
Return to Master TOC

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The wire will not feed when the Start Switch is pressed. There is no voltage indicated on the LT-7 voltmeter. The wire does inch up and down properly.	1. If LED 2M on the Logic Board is ON the ground lead protector has tripped. Make sure the LT-7 head or electrode are NOT contacting the LT-7 frame or control box. **NOTE:** Conductive dirt or shavings can cause the ground lead protector to trip. Remove the power to unit and clean it. See the ***Ground Lead Protector*** discussion in the Maintenance section of this manual for more information. 2. While pressing the Start Switch observe LED 2B. It should be ON. If not the Start Switch (S5) or associated wires may be faulty. See the ***Wiring Diagram.***	1. If LED 2B is ON when the start switch is pressed and LED 2M does NOT turn ON then the Logic Board may be faulty.
The wire will NOT inch down but inches up properly. When the Start Switch is pressed the wire does not feed.	1. Press the inch down switch and observe LED 1B on the Control Board. If LED 1B is ON and the motor does not activate the Control Board may be faulty.	1. If LED 1B does NOT turn ON, when the Inch Down switch is pressed, measure the DC voltage from lead #586 to lead #539 while pressing the Inch Down switch. Normal voltage is 12 to 15VDC. • If the voltage is correct the Control Board may be faulty. • If voltage is not correct the Logic Board may be faulty.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

Return to Section TOC
Return to Master TOC

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The wire will NOT inch down but does inch up properly. When the Start Switch is pressed the wire feeds down properly.	1. While pressing the Inch Down Switch observe LED 2J. It should be ON. If not the inch down switch (S4) or associated wires may be faulty. See the ***Wiring Diagram***. 2. Move the VV Board jumper to the 'L' terminal and press the Inch Down switch. If LED 2J comes ON but the wire still does not feed, the Logic Board may be faulty.	1. Disconnect lead #21 from the welder terminal strip. Turn on input power and while pressing the Inch Down Switch observe LED 3A. If LED 3A does NOT light the Variable Voltage Board may be faulty. Replace board and reconnect lead #21. If LED 3A turns ON with lead #21 disconnected, the resistance across leads #21 and #67 is too low. The resistance must be above 500 ohms. See the ***Variable Voltage Board*** discussion in Section F. The low resistance could also be caused by the following: • A lead or object external to the power source or LT-7 causing a low resistance between leads #21 and #67. • A non-Lincoln power source that does not have the required impedance. • A defective power source.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

Return to Section TOC
Return to Master TOC

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The wire will not inch down. The wire inches up properly. When the Start Switch is pressed the wire feeds up instead of down.	1. Check the connections between the power source and LT-7 for loose or incorrect connections. 2. Check the leads connected to the Variable Voltage Board for loose or faulty connections. 3. While pressing the Inch Down Switch observe LED 3A on the Variable Voltage Board. • If LED 3A is OFF check leads #21 and #67 for continuity to the Variable Voltage Board. 4. Press the Inch Down Switch and check LED 3A on the VV Board and LED 2E on the Logic Board: • If LED 3A and 2E are both ON the Control Board may be faulty. • If LED 3A is ON but light 2E is OFF the Logic Board may be faulty.	1. Check lead #21 at the VV Board for continuity (zero ohms) to “work”. 2. Check lead #67 at the VV Board for continuity (zero ohms) to electrode.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

Return to Section TOC
Return to Master TOC

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
When inching down, the wire does not stop feeding when it touches the work piece.	1. The jumper on the Variable Voltage Board must be connected to the "H" pin for the Auto-Stop circuit to function. See the ***Variable Voltage Board*** discussion in Section F of this manual.	1. Check lead #21 for continuity (zero ohms) to "work". 2. Check lead #67 for continuity (zero ohms) to electrode. 3. The Logic Board may be faulty. 4. The Variable Voltage Board may be faulty.
The wire will not inch up. The wire inches down properly.	1. With LT-7 at idle (not feeding wire) observe LED 1D on the Control Board. The light should be ON. If LED 1D is OFF the Control Board may be faulty. 2. While pressing the inch up switch observe LED 1A on the Control Board. If LED 1A does NOT light, check the inch up switch and associated leads. (#593 and #539) See the ***Wiring Diagram***.	1. If LED 1A does light but the wire does not feed the Control Board may be faulty. Replace.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

Return to Section TOC
Return to Master TOC

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The wire feeds up with either inch switch.	1. While pressing the Inch Down Switch observe LED 2E on the Logic Board. If LED 2E does NOT light the Logic Board may be faulty. 2. If LED 2E does light the Control Board may be faulty.	1. Check the wiring to the Inch Down Switch. See the Wiring Diagram. 2. Check the wiring between the Logic Board and the Control Board. See the ***Wiring Diagram***.
The wire feeds at full speed during the weld mode (only).	1. Remove electrode from drive rolls and place a jumper wire from lead #528 to lead #539 on the reed switch(CR3) in the shunt box. Press the Start Switch and observe LEDs 2L and 2D on the Logic Board. Both lights should be ON. If light 2D is ON and light 2L is OFF, the Logic Board may be faulty. 2. If light 2D does light check continuity (zero ohms) of leads #528 and #539 from the reed switch (CR3) to the Logic Board. See the ***Wiring Diagram.***	1. Check leads #634, #641 and #642 between wire feed speed control (R3) and Logic Board. 2. Check R3 rheostat for correct resistance (5000 ohms) and proper function.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

Return to Section TOC
Return to Master TOC

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The wire feeds at full speed in both inch and weld modes	1. With the LT-7 at idle (not feeding wire) observe light 2F on the Logic Board. If light 2F is ON the Control Board may be faulty. 2. If light 2F is OFF, the Logic Board may be faulty.	1. Perform the ***Wire Drive Motor Test***. The Field circuit may be open.
The wire has limited or erratic speed control in one or more modes. **NOTE:** The lower control always adjusts wire speed.	1. Put the CV-VV switch is in the CV mode. If the motor runs properly, the Variable Voltage Board may be faulty. 2. The Logic Board may be faulty. 3. The Control Board may be faulty.	1. Perform the ***Wire Drive Motor Test***. 2 Check the motor brushes. 3. Check the wire feed speed control (R3) for resistance and smooth operation. Normal resistance is 5000 ohms.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

Return to Section TOC
Return to Master TOC

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The wire feeds up instead of down when the Start Switch is pressed. There is no voltage reading on LT-7 voltmeter. The wire inches up and down properly.	1. Check for proper connection of electrode leads and control cable leads from power source to LT-7. 2. On Lincoln power sources put a jumper from #2 to #4 on the terminal strip. This activates the output from the power source. • Test for voltage at the output terminals of the power source. If no voltage is indicated then the power source is faulty. • If voltage is present at the power source output terminals it should also be present at the LT-7 voltmeter. If not, the Control Cable may be defective. 3. Remove electrode from drive rolls and press the Start Switch. Observe LED 2K on the Logic Board. It should be ON. If LED 2K does light when the Start Switch is pressed remove power to unit. Remove lead #682 from CR1. Check the resistance of the coil from the terminal to lead #510. Normal resistance is 10,000 ohms. See the ***Wiring Diagram.*** 4. If the relay coil resistance is correct the Logic Board may be faulty. 5. If light 2K does turn ON make sure the relay (CR1) contacts are working.	1. Check lead #21 for continuity (zero ohms) to “work”. 2. Check lead #67 for continuity (zero ohms) to electrode. 3. Check leads #2 and #4 for loose or faulty connections between relay CR1 and the control cable receptacle.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

Return to Section TOC
Return to Master TOC

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
No control of power source output from LT-7 tractor. Power source does have output. **NOTE:** The upper control always adjusts the power source output.	1. Check control cable leads for proper connection to power source. 2. Make sure the Lincoln power source is in the remote control mode.	1. Check the continuity of leads A, B, and C in the control cable. **NOTE:** Older cabes were labled 75,76 & 77 instead of A,B,C 2. Check the resistance and operation of the voltage control rheostat (R2). Normal resistance is 10,000 ohms. 3. Check the continuity of leads #75, #76 and #77 from the control rheostat (R2) to the control cable receptacle.
The circuit breaker trips while the LT-7 is at idle (not feeding wire).	1. Disconnect the wire feed and travel motors one at a time. If the breaker holds, check that motor. 1. Isolate the problem by unpluging the printed circuit boards one at a time and checking to see if circuit breaker trips.	1. If the problem is not in a motor or a printed circuit board then check the wiring harness for “shorts” or grounded leads.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

Return to Section TOC
Return to Master TOC

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The power source output contactor does NOT “drop out”. The power source output terminals are always electrically hot.	1. With the LT-7 at idle (not feeding wire) observe LED 2K on the Logic Board. It should be OFF. If LED 2K is ON, the Logic Board may be faulty. 2. If LED 2K is OFF (with the LT-7 at idle) locate and remove the power and disconnect lead #4 from the 1CR relay. • If the power source output drops off, the 1CR relay may be faulty. • If the power source output stays “ON” the problem is in the control cable or the power source.	1. Turn the power source OFF and disconnect the LT-7 Control Cable (if using a 14 pin MS type Connrector) or disconnect lead #4 from the Terminal Strip. Turn the power source ON. • If the output is still “hot” with the control cable or lead #4 disconnected, the power source is defective
The welding and travel do not stop when the stop switch is pressed.	1. Press and hold the Stop Switch while observing LED 2C.	1. If light 2C is ON the Logic Board may be faulty. 2. If LED 2C is OFF (while pressing the Stop Switch) check the switch and associated leads.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

Return to Section TOC
Return to Master TOC

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The travel motor does not run in either the "MANUAL" or "AUTOMATIC" position.	1. Make sure the circuit breaker is NOT tripped. 2. Set the travel switch in "manual" mode. Check the voltage at the travel board #531 to #632 at the circuit breaker. Normal is 105 to 130VAC. If the correct voltage is NOT present check the circuit breaker, the R5 resistor, the travel switch and the associated wiring. See the ***Wiring Diagram.*** 3. If the correct AC voltage IS present at leads #531 to #632 then check the DC voltage at the travel direction switch (S7). (Leads #561 to #559). Normal is 85VDC. with the travel speed set at maximum. If the correct DC voltage is NOT present at leads #561 to #559 the travel board may be faulty. Also check the travel speed control (R6) and the associated wiring. See the ***Wiring Diagram.***	1. Check the DC armature voltage being applied to the travel motor. Leads #595 to #594. Normal is 0 to 85VDC. depending upon the travel speed setting. **NOTE:** In older units the travel motor may be a shunt wound motor with separately powered field coils. Normal field voltage is 90 to 110VDC. This may be measured at leads #656 to #657. If field voltage is missing check field fuse F401 on travel board. 2. If the armature voltage is NOT present at leads #595 to #594 check the travel direction switch and associated wiring. See the ***Wiring Diagram***. 3. If the armature voltage (and the field voltage in older units) is correct, perform the ***Travel Motor Test***.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

Return to Section TOC
Return to Master TOC

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The travel motor will not run with travel switch set on “automatic”. The motor runs properly with travel switch set to “Manual.”	1. Check LED 2H on Logic Board. LED 2H should be lit when automaic travel is required. If LED 2H does NOT light check the coil resistance of relay 2CR. Normal resistance is 10,000 ohms. 2. If 2CR coil is good and LED 2H does NOT light, when automatic travel is required, the Logic Board may be faulty. 3. If LEDt 2H does light and relay 2CR activates the contacts in 2CR may be faulty.	1. The travel control switch (S2) or associated wiring may be faulty. See the ***Wiring Diagram***. Check and repair or replace if necessary.
The travel motor runs continuously when set to “AUTOMATIC”.	1. Observe LED 2H on Logic Board. LED 2H should only be ON if the Start button has been presed. If LED 2H is lit continuously the Logic Board may be faulty.	2. If LED 2H works correctly, the contacts in relay 2CR may be stuck closed. Replace relay.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

Return to Section TOC
Return to Master TOC

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The travel circuit breaker trips repeatedly.	1. While unit is traveling check the the travel motor armature current. Normal current is 0.5 amps DC. (Note: In older units also check for field voltage of 90 to 110VDC at leads #656 to #657. If field voltage is missing check field fuse F401 on travel board). 2. If the current is too high check for possible excessive external loading of the travel motor such as gummed up gears, excessive cable drag or other obstacles. 3. The travel board may be faulty.	1. If all tests are good the circuit breaker may be faulty. Test or replace.
The travel motor runs at full speed with no control.	1. Remove power to unit and check the resistance of travel speed control rheostat (R6). Normal resistance is 5000 ohms. Also check R6 for smooth operation. 2. Check associated leads between R6 and the travel board. 3. The travel board may be faulty.	1. Perform the ***Travel Motor Test***.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

Return to Section TOC
Return to Master TOC

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The travel motor runs with limited speed. The control may be erratic.	1. Remove power to unit and check the resistance of travel speed control rheostat (R6). Normal resistance is 5000 ohms. Also check R6 for smooth operation. 2. Check associated leads between R6 and the travel board. 3. The travel board may be faulty.	1. Perform the ***Travel Motor Test***.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

Return to Section TOC
Return to Master TOC

Observe Safety Guidelines detailed in the beginning of this manual.

PC BOARD STATUS LIGHTS

Table H.1 is a summary of the on/off states of the LED's on the Control Board, Logic Board and Variable Voltage Board for various conditions of the LT-7. Table H.2 lists the functions that these LED's indicate.

TABLE H.1 P.C. BOARD STATUS LIGHTS

INDICATOR LIGHTS		CONDITIONS FOR LIGHT "ON"						
LIGHT NO.	LOCATION	IDLE MODE	INCH UP SWITCH PRESSED	INCH DOWN SWITCH PRESSED	START SWITCH PRESSED	STOP SWITCH PRESSED	BURNBACK MODE	GROUND LEAD PROTECTOR TRIPPED
1A	CONTR. BD.		ON					
1B	CONTR. BD.			ON	ON			
1C	CONTR. BD.			ON	ON			
1D	CONTR. BD.	ON	ON			ON	ON	ON
1E	CONTR. BD.		ON	ON	ON			
2B	LOGIC BD.				ON			
2C	LOGIC BD.					ON	ON	ON
2D	LOGIC BD.	ON*	ON*	ON*	ON	ON		ON*
2E	LOGIC BD.			ON	ON			
2F	LOGIC BD.	ON	ON	ON			ON	ON
2H	LOGIC BD.				ON			
2J	LOGIC BD.			ON				
2K	LOGIC BD.				ON		ON	
2L	LOGIC BD.				ON			
2M	LOGIC BD.							ON
3A	VOLT BD.			ON	ON		ON	
3B	VOLT BD.			ON	ON		ON	

* INDICATES LIGHT MAY BE ON BUT DIM

TABLE H.2 P.C. BOARD STATUS LIGHT DEFINITIONS

LIGHT NUMBER	FUNCTIONS INDICATED BY PC BOARD LEDS
1A	INCH UP SWITCH PRESSED
1B	LOGIC SIGNAL FOR MOTOR TO RUN
1C	DOWN FIELD VOLTAGE APPLIED
1D	UP FIELD VOLTAGE APPLIED
1E	ARMATURE VOLTAGE APPLIED
2B	START SWITCH PRESSED
2C	STOP SWITCH PRESSED
2D	WELD CURRENT PRESENT
2E	SIGNAL TO APPLY DOWN FIELD VOLTAGE
2F	INCH SPEED CIRCUIT OPERATIVE
2H	SIGNAL TO ENERGIZE TRAVEL CIRCUIT
2J	INCH DOWN SWITCH PRESSED
2K	SIGNAL TO OPERATE POWER SOURCE CONTACTOR
2L	SPEED CONTROL OPERATIVE Amps in CC Mode - Voltage in CC (VV) Mode
2M	GROUND LEAD PROTECTOR "TRIPPED"
3A	ELECTRODE VOLTAGE PRESENT(OUTPUT FROM VV BOARD)
3B	ELECTRODE VOLTAGE PRESENT(INPUT TO VV BOARD)

Return to Section TOC
Return to Master TOC

Observe Safety Guidelines detailed in the beginning of this manual.

FIGURE H.1 LOGIC P.C. BOARD LED LOCATIONS

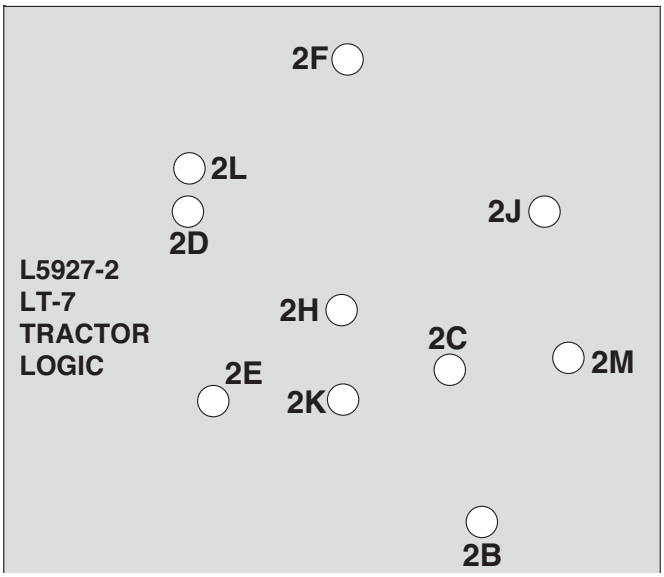


FIGURE H.2 VARIABLE VOLTAGE P.C. BOARD LED LOCATIONS

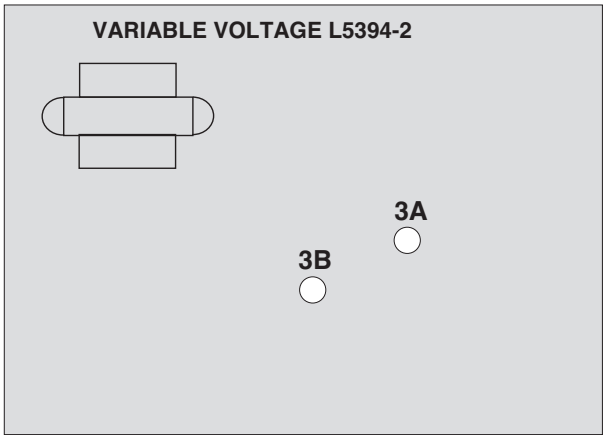
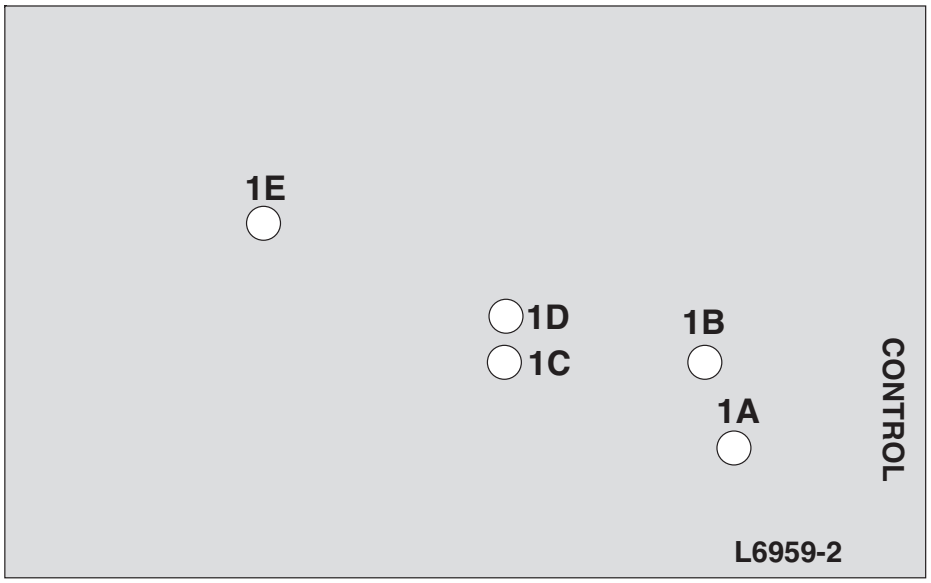


FIGURE H.3 CONTROL P.C. BOARD LED LOCATIONS



NOTES

H-22

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

WIRE DRIVE MOTOR TEST

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This procedure will aid the technician in determining if the Wire Drive Motor is functioning properly

MATERIALS NEEDED

Misc. Hand Tools
0 to 90 vdc Power Supply
120 vdc Power Supply
Volt/Ohmmeter

WIRE DRIVE MOTOR TEST (continued)

PROCEDURE

1. Remove the wire feed motor connector from the LT-7 control box.
2. Using the ohmmeter measure the motor resistances per Table H.3. Also see Figure H.4
3. If the motor resistance test is good proceed to the Motor Applied Voltage Test.

MOTOR APPLIED VOLTAGE TEST

1. Carefully connect the 110VDC supply (SUPPLY TURNED OFF) to pins C and D on the motor connector.
2. Carefully connect the variable 0 to 90VDC supply (SUPPLY TURNED OFF) to pins A and B on the motor connector.(See Table H.3)
3. Apply field voltage first (pins C and D) to the motor. Then slowly apply the armature voltage on pins A and B.(See Table H.3)
4. The motor should run and the speed should vary with changes to the armature voltage.
5. If the motor does NOT run and change speed correctly the motor or gear box may be faulty.
6. To stop motor REMOVE ARMATURE VOLTAGE FIRST. (Pins A and B)

FIGURE H.4 - WIRE DRIVE MOTOR CONNECTOR PINS

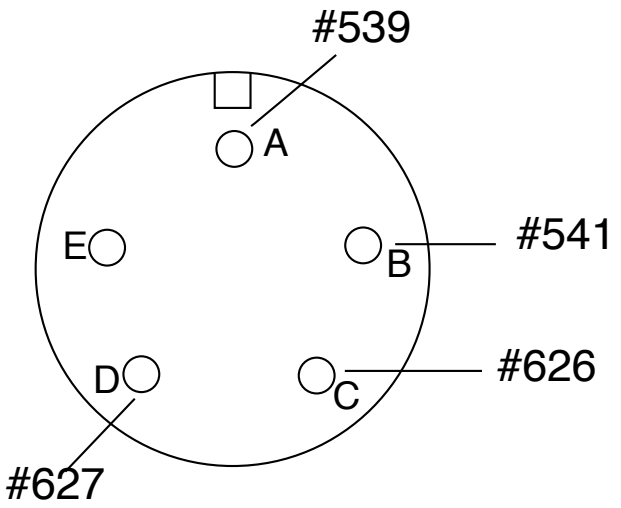


TABLE H.3

TEST POINTS	RESISTANCE	DC VOLTAGE
Lead #539 to #541 Armature	4 to 5 ohms	0 to 90VDC
Lead #626 to #627 Field Winding	750 to 850 ohms	90 to 120VDC
All leads to motor shell	500,000 ohms min.	NONE

TRAVEL MOTOR TEST

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This procedure will aid the technician in determining if the Travel Motor is functional.

MATERIALS NEEDED

Misc. Hand Tools
0 to 90 vdc Power Supply
120 vdc Power Supply (only required for older 'shunt wound' motors).
Volt/Ohmmeter

Return to Section TOC
Return to Master TOC

TRAVEL MOTOR TEST (continued)

PROCEDURE

1. Remove the travel motor connector from the LT-7 control box.

2. Using the ohmmeter measure the motor resistances per Table H.4. Also see ***Figures H.5. and H.6****

3. If the motor resistance test is good proceed to the Motor Applied Voltage Test.

MOTOR APPLIED VOLTAGE TEST

1. *Carefully connect the 110VDC supply (SUPPLY TURNED OFF) to pins C and D on the travel motor connector. See ***Figure H.6.***

2. Carefully connect the variable 0 to 90VDC supply (SUPPLY TURNED OFF) to pins A and B on the travel motor connector.

3. *Apply field voltage first (pins C and D) to the motor. See ***Figure H.6*** and Table H.4

4. Slowly apply the armature voltage on pins A and B.(See Table H.4)

5. The motor should run and the speed should vary with changes to the armature voltage.

6. If the travel motor does NOT run and change speed correctly the motor or gear box may be faulty.

7. *To stop motor REMOVE ARMATURE VOLTAGE FIRST. (Pins A and B)

* Codes Below 9100 with ,shunt wound motor'

TABLE H.4

TEST POINTS	RESISTANCE	DC VOLTAGE
Lead #594 to #595 Armature	25 ohms	0 to 90VDC
Lead #559 to #561 Armature*	27 ohms*	0 to 90VDC*
Lead #546 to #547 Field Winding*	500 to 650 ohms*	90 TO 110VDC*
All leads to motor shell	500,000 ohms min.	NONE

* Codes below 9100 with 'shunt wound' motor

TRAVEL MOTOR TEST (continued)

FIGURE H.5 - TRAVEL MOTOR CONNECTOR

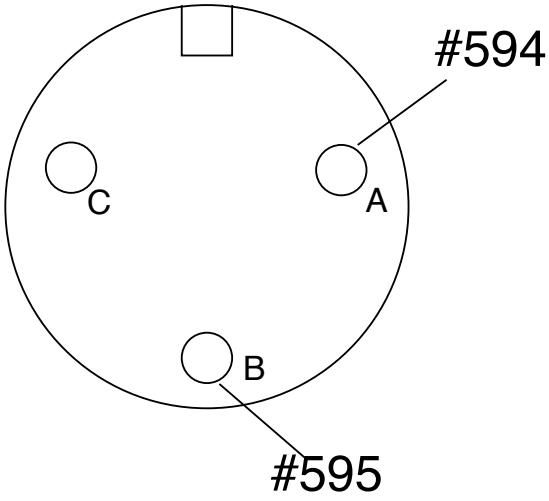
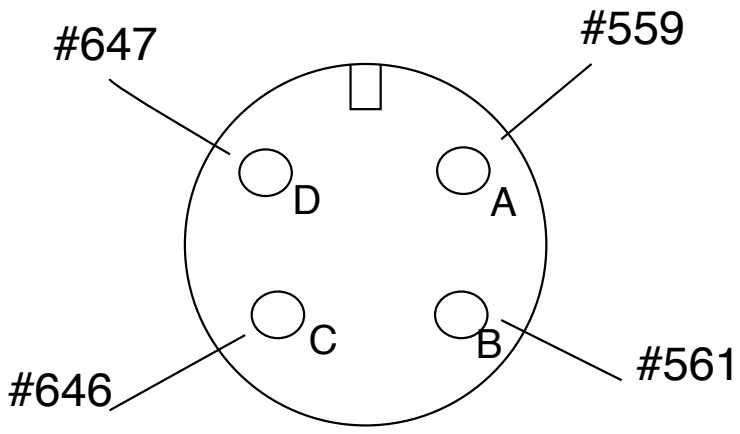


FIGURE H.6 - TRAVEL MOTOR CONNECTOR SHUNT WOUND MOTOR



NOTES

H-28

WIRE DRIVE MOTOR REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

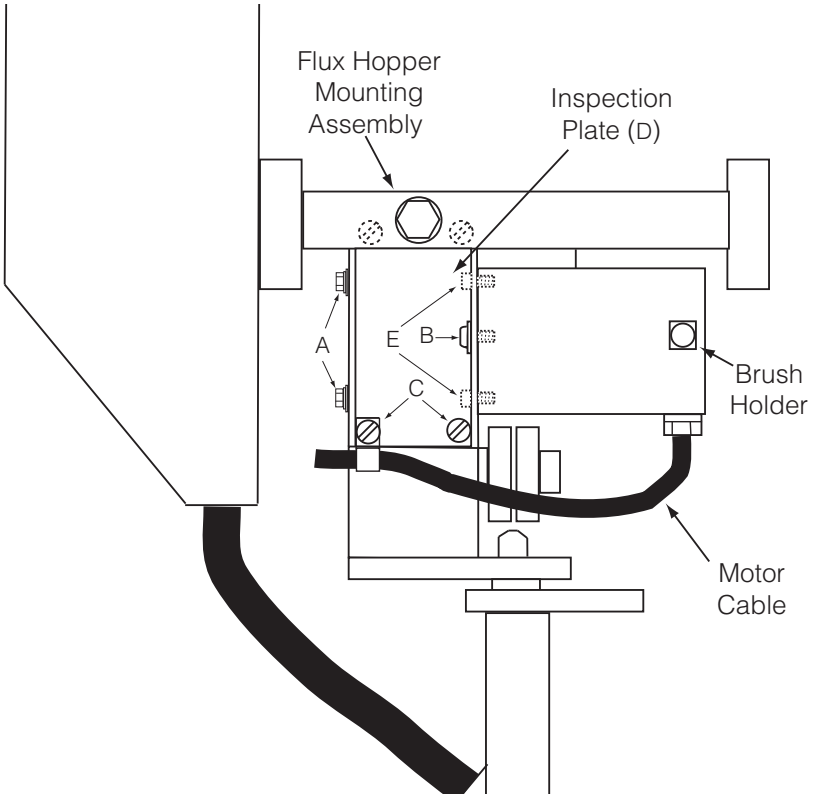
This procedure will aid the technician in the removal and replacement of the LT-7 Wire Feed Motor.

MATERIALS NEEDED

Misc. Hand Tools

WIRE DRIVE MOTOR REMOVAL AND REPLACEMENT PROCEDURE (cont.)

FIGURE H.7 – WIRE DRIVE MOTOR REMOVAL



MOTOR REMOVAL PROCEDURE

1. Disconnect the wire drive motor cable from the LT-7 control box.

2. Remove the two 1/4”-20 bolts and washers (A) and the socket head cap screw (B) that hold the Flux Hopper Mounting Assembly to the gear box housing.

NOTE: Removing the Flux Hopper first will make it easier to remove and re-install the Bumper Handle assembly.

3. Locate and remove the four (4) small slotted head screws (C) holding the inspection cover plate (D) to the gear box housing. Note placement of rubber gasket and cable strain relief clamp.

4. Locate and remove the two socket head cap screws (E) holding the motor to the gear box housing. Note the position of the motor cable and brushholders.

NOTE: Accesss to the motor mounting screws is through the 1/4” holes where the Flux Hopper Mounting Assembly was bolted to the gear box.

5. Carefully remove the motor (with pinion gear) from the gear box assembly.

MOTOR REPLACEMENT PROCEDURE

1. Carefully install the replacement motor (with pinion gear) and mount it to the gear box housing using the two socket head caps screws so that the brush holders and cable are positioned as shown.

2. Using the four small slotted head screws install the inspection cover plate along with the rubber gasket and cable clamp.

3. Install the Flux Hopper Mounting Assembly with the socket head cap screw and the 1/4”-20 hardware from Step 2 of the removal procedure.

4. Install the flux hopper to the Flux Hopper Assembly and secure it with the hex head bolt.

5. Connect the wire drive motor cable to the LT-7 control box receptacle.

Return to Section TOC
Return to Master TOC

TRAVEL MOTOR REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the LT-7 Travel Motor

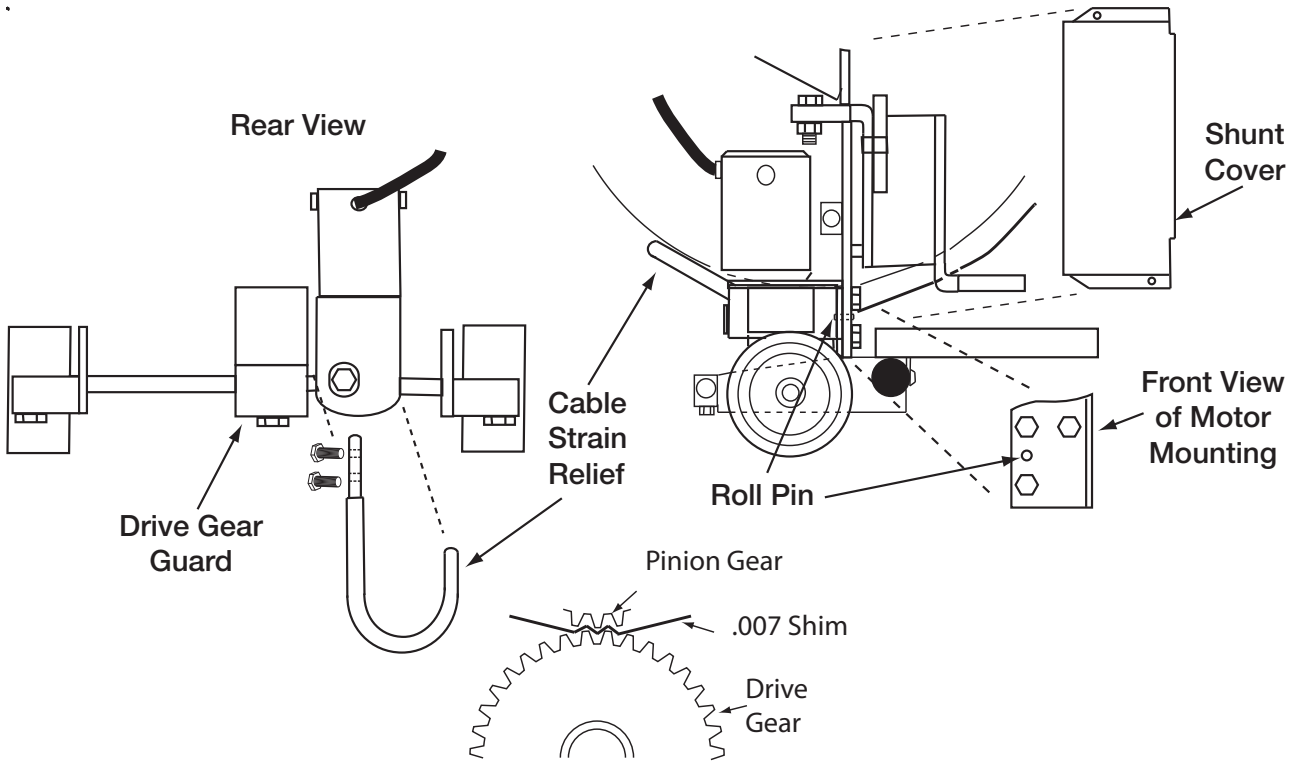
MATERIALS NEEDED

Misc. hand tools

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

TRAVEL MOTOR REMOVAL AND REPLACEMENT PROCEDURE (cont.)

FIGURE H.8 – TRAVEL MOTOR REMOVAL



REMOVAL PROCEDURE:

1. Disconect the Control Cable and Weld cables from the LT-7.
2. Remove the Drive Gear Guard and Cable Strain Relief and save for reassembly.
3. Remove the Shunt Cover to gain access to the Travel Motor mounting bolts.
4. Remove the travel motor by first removing the two easily accesible bolts then using an open end wrench, simultaneously loosen the third bolt while pulling the motor away from the frame.
5. Remove the 1/8” roll pin from the frame or the motor and save with the mounting bolts for reassembly. If the roll pin is damaged during removal, obtain a new one (T9967-8). See Figure H.8.

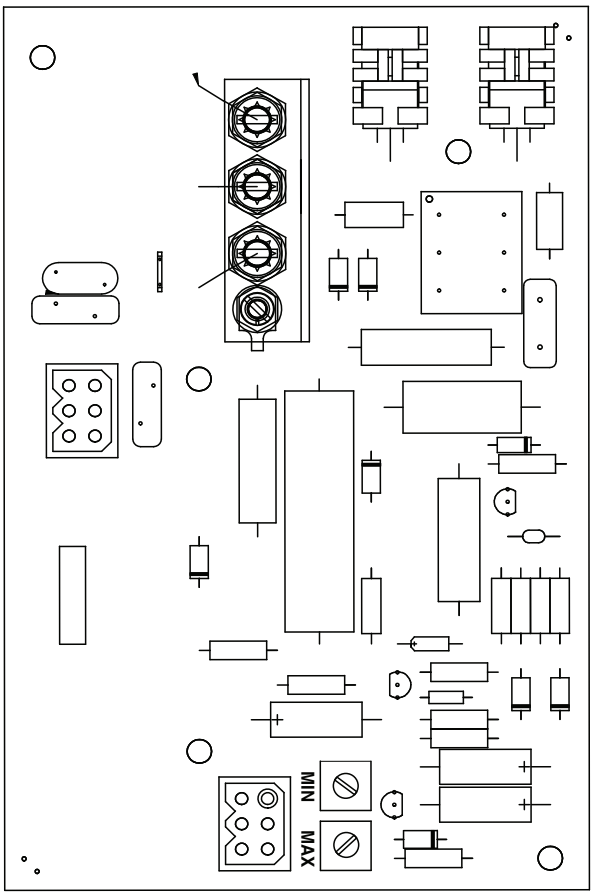
REPLACEMENT PROCEDURE:

1. Loosely mount the new Travel Motor using the three mounting bolts and associated washers.
2. Make sure that the pinion gear of the new motor assembly is fully engaged with the Drive gear on the shaft and with a piece of .007” shim material between the engaged gears.
3. Tighten all three mounting bolts.
4. Using a .125/.129” bit, drill through the existing hole in the frame into the motor flange and insert the roll pin to lock the motor in place. See Figure H.8.
5. Replace the shunt cover being certain that none of the leads are loose or pinched.
6. Replace ther Cable Strain Relief and the Drive Gear Guard.
7. Reconnect the Control Cable and energize the power source to see that the travel runs smoothly with no binding in the gears.
8. Check the calibration of the Travel Control Board.

Return to Section TOC
Return to Master TOC

TRAVEL MOTOR REMOVAL AND REPLACEMENT PROCEDURE (cont.)

FIGURE H.9 - TRAVEL PC BOARD AND NAMEPLATE



CALIBRATION PROCEDURE:

1. Remove the input power from the LT-7 and take the side cover off of the Travel Control Box.
2. Locate the 'MAX' and 'MIN' trimmers on the Travel Control PC Board. See Figure H.9.
3. Dis-engage the travel mechanism and apply power to the LT-7.
4. Turn the Travel Switch to 'MANUAL TRAVEL' and with the Travel Speed set to ~ 50 IN/MIN, allow the motor to warm up for a few minutes.
5. Turn the Travel Switch to OFF. Engage the drive mechanism and set the Travel Speed Control to Maximum.
6. Slightly load the LT-7 by dragging a length of Control Cable and/or Welding Cable.
7. Turn the travel on and measure the distance traveled in 30 seconds. It should be 23 to 26 inches.
   - If it travels further than 26", adjust the MAX trimmer counter clockwise and re-test.
   - If it travels less than 23', adjust the MAX trimmer clockwise and re-test.
8. Turn the travel OFF and set the Travel Speed Control to Minimum. Start the travel and measure the distance traveled in 1 minute. It should be .6 to 2.00 inches.
   - If it travels further than 2', adjust the MIN trimmer counter clockwise and re-test.
   - If it travels less than .5"', adjust the MIN trimmer clockwise and re-test.
9. Repeat steps 7 and 8 as necessary to ensure proper calibration.
10. Turn off the input power and replace the Travel Control Box cover.

Return to Section TOC
Return to Master TOC

RETEST AFTER REPAIR

To run a functional test of the LT-7 Tractor it will be necessary to provide a source of 120vac to the Control Box. This can be accomplished in any of several ways.

1. Connect the LT-7 to a compatible Lincoln Power Source.

If a welder is not available:

2. For Control Cables that do not have a 14 pin connector, put a 120 volt plug on leads 31, 32 and Ground.

   For Control Cables with a 14 pin connector, use a K1798 adpter and a 120 volt plug as above.

3. Make a “cheater cord” to plug into the 9 pin connector of the LT-7 using an MS type connector (LE Co # S12020-8).

Bring out all 9 leads from the connector and label them per the ***Wiring Diagram*** .

Connect the 120 volt plug to leads 31, 32 and ground as above.

TEST PROCEDURE

NOTE: All testing should be done in the CV mode unless otherwise directed.

Apply power to the LT-7 using one of the methods described above

⚠ WARNING

ELECTRIC SHOCK can kill.

- Have an electrician install and service this equipment. Turn the input power OFF at the fuse box before working on equipment. Do not touch electrically hot parts.

1. Check the LEDs on the PC Boards to see that the “Idle Mode” is correct. See ***Table H.5.***

2. Press the Inch Down Switch and see that the drive rolls turn in the proper direction.

3. Press the Inch Up Switch and see that the dtive rolls turn in the proper direction.

4. Press the Start Switch and observe the following:

⚠ WARNING

If connected to a welder, be aware that all items at electrode potential will be “HOT”.
See *Figure H.10.*

a. Check the LEDs on the PC Boards per ***Table H.5***.

Note: If not connected to a welder, place the VV Board jumper on the “L” terminal.

b. See that the wire feed motor feeds forward at inch speed.

c. The OCV should be adjustable with the upper control on the front panel.

   If not connected to a welder, use an ohmmeter to check for 0 ohms between leads 2 & 4 of the input connector. Check from 75 to 76. It should vary from 0 to 10,000 ohms as the control is varied. Repeat test on leads 76 & 77.

d. See that the travel motor works according to the Travel Controls and that the travel speed is adjustable.

e. Use a magnet to close the 3CR reed switch **(See *Figure H.9)*** or jumper leads 528 and 539 at the Logic Board. See the ***Wiring Diagram.***

   1. Check to see that LED 2D is ON

   2. The motor speed should be adjustable from min. to max. with the lower control on the front panel.

5. Press the Stop Switch and disconnect the input power.

If any of the functions are not as described check the ***Troubleshooting Guide*** for possible solutions.

Return to Section TOC
Return to Master TOC

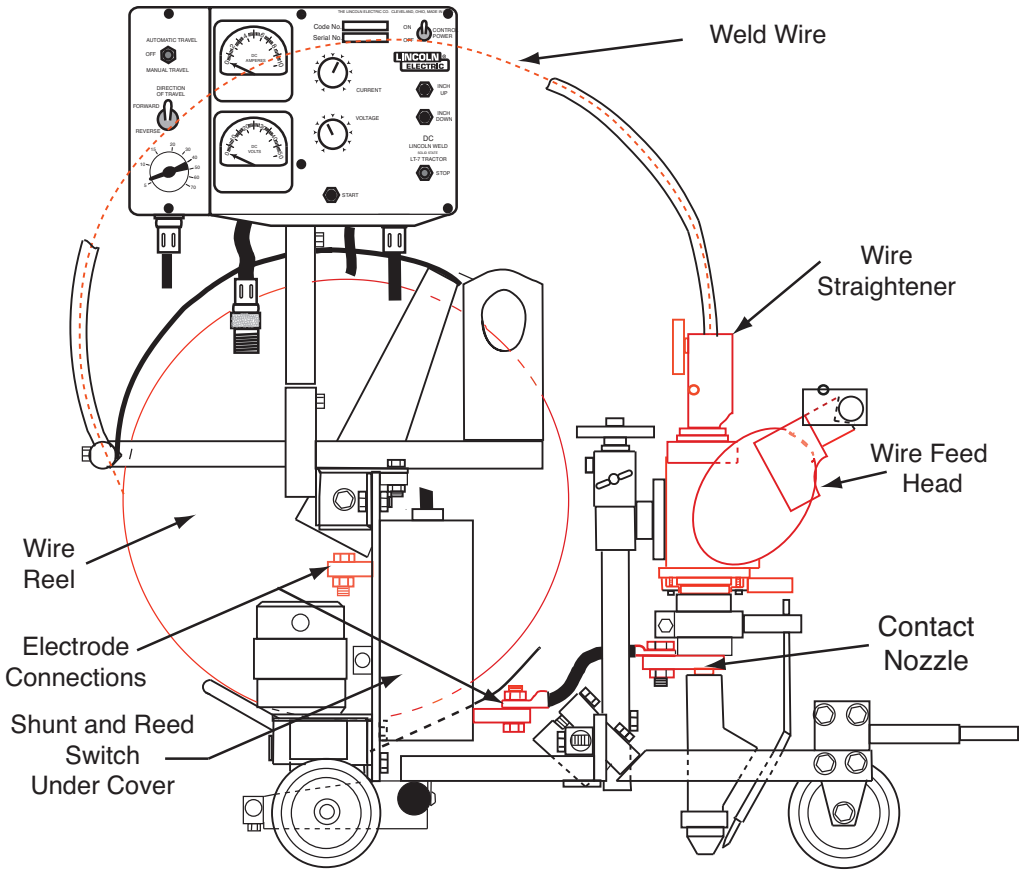
RETEST AFTER REPAIR

TABLE H.5 - P.C. BOARD STATUS LIGHTS

INDICATOR LIGHTS		CONDITIONS FOR LIGHT "ON"						
LIGHT NO.	LOCATION	IDLE MODE	INCH UP SWITCH PRESSED	INCH DOWN SWITCH PRESSED	START SWITCH PRESSED	STOP SWITCH PRESSED	BURNBACK MODE	GROUND LEAD PROTECTOR TRIPPED
1A	CONTR. BD.		ON					
1B	CONTR. BD.			ON	ON			
1C	CONTR. BD.			ON	ON			
1D	CONTR. BD.	ON	ON			ON	ON	ON
1E	CONTR. BD.		ON	ON	ON			
2B	LOGIC BD.				ON			
2C	LOGIC BD.					ON	ON	ON
2D	LOGIC BD.	ON*	ON*	ON*	ON	ON		ON*
2E	LOGIC BD.			ON	ON			
2F	LOGIC BD.	ON	ON	ON			ON	ON
2H	LOGIC BD.				ON			
2J	LOGIC BD.			ON				
2K	LOGIC BD.				ON		ON	
2L	LOGIC BD.				ON			
2M	LOGIC BD.							ON
3A	VOLT BD.			ON	ON		ON	
3B	VOLT BD.			ON	ON		ON	

* INDICATES LIGHT MAY BE ON BUT DIM

FIGURE H.10 - ITEMS AT WELD POTENTIAL



LT-7 TRACTOR

LINCOLN ELECTRIC

Return to Section TOC
Return to Master TOC

NOTES

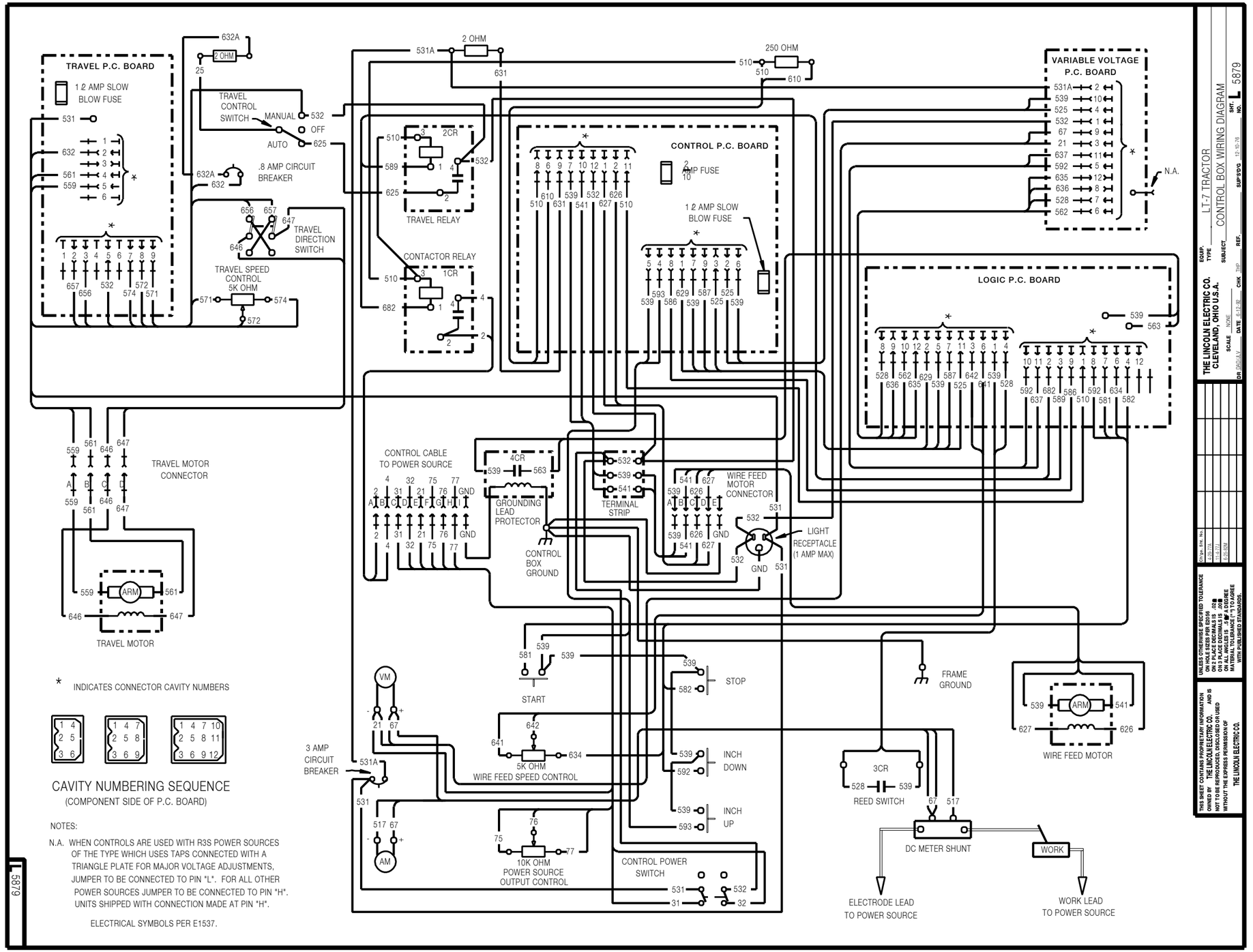
H-36

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

TABLE OF CONTENTS - DIAGRAM SECTION

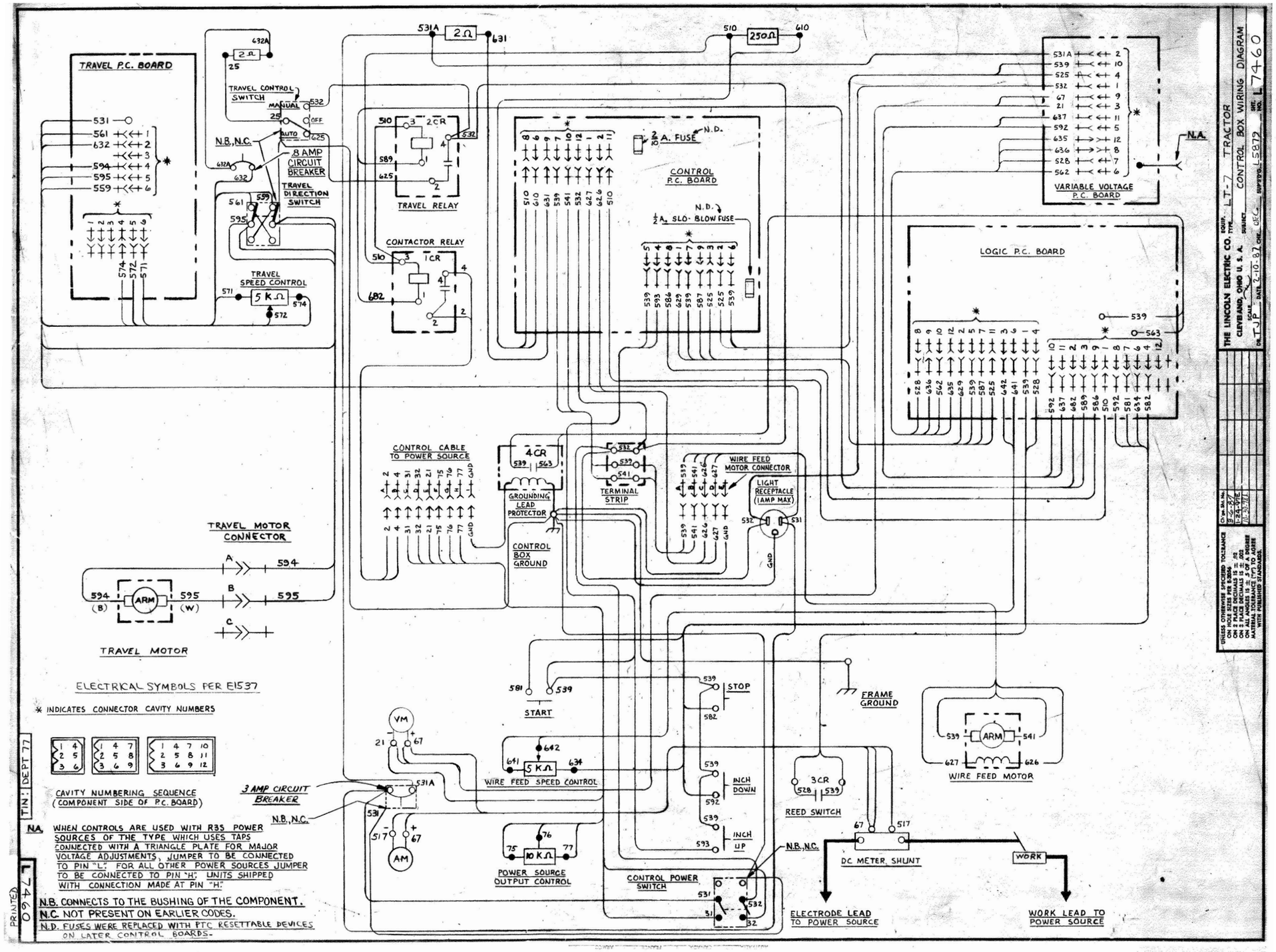
Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

WIRING DIAGRAM - C0DES BELOW 9100 - L5879



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual. The wiring diagram specific to your code is pasted inside one of the enclosure panels of your machine.

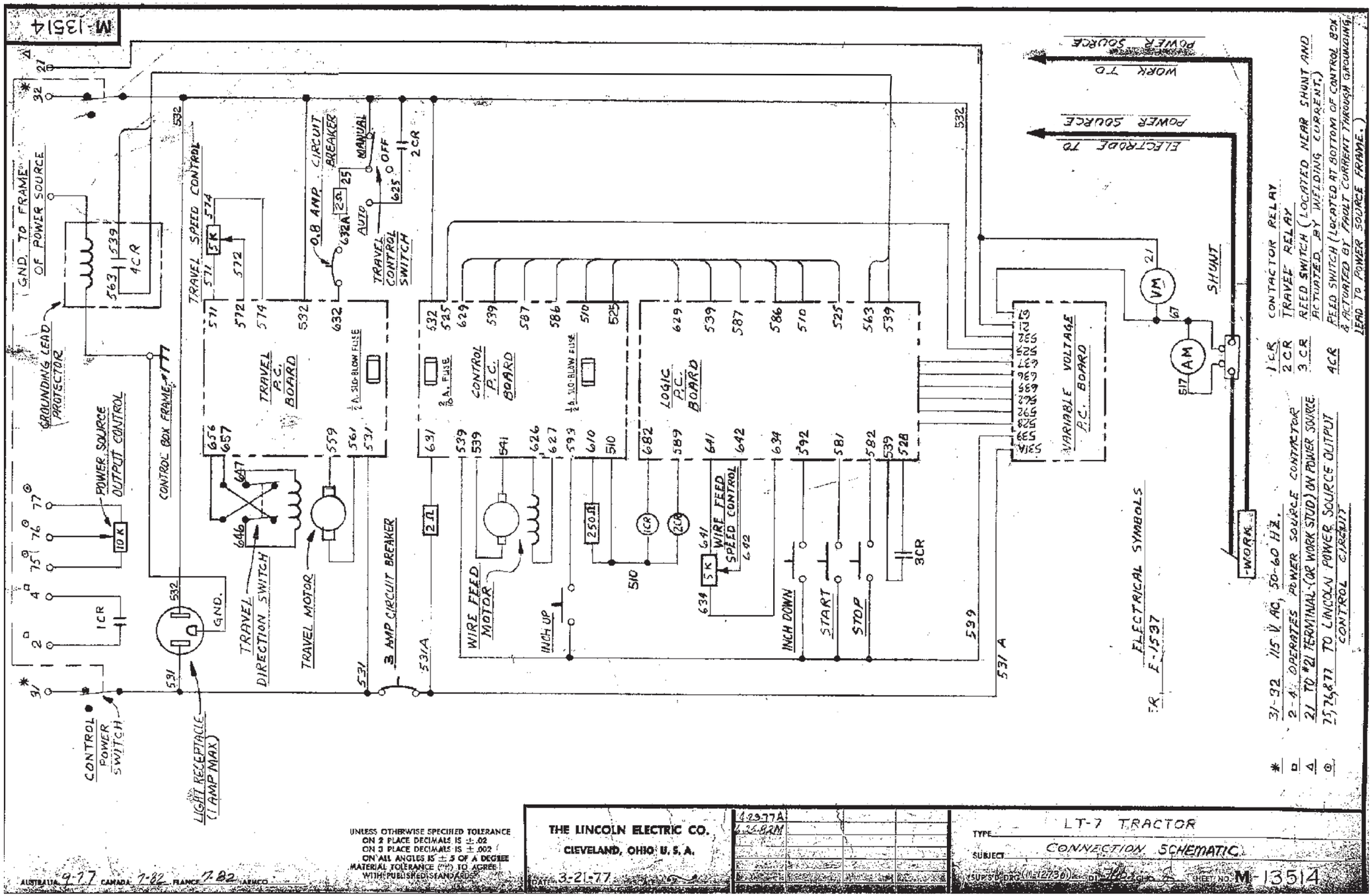
WIRING DIAGRAM - CODES ABOVE 9100 - L7460



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual. The wiring diagram specific to your code is pasted inside one of the enclosure panels of your machine.

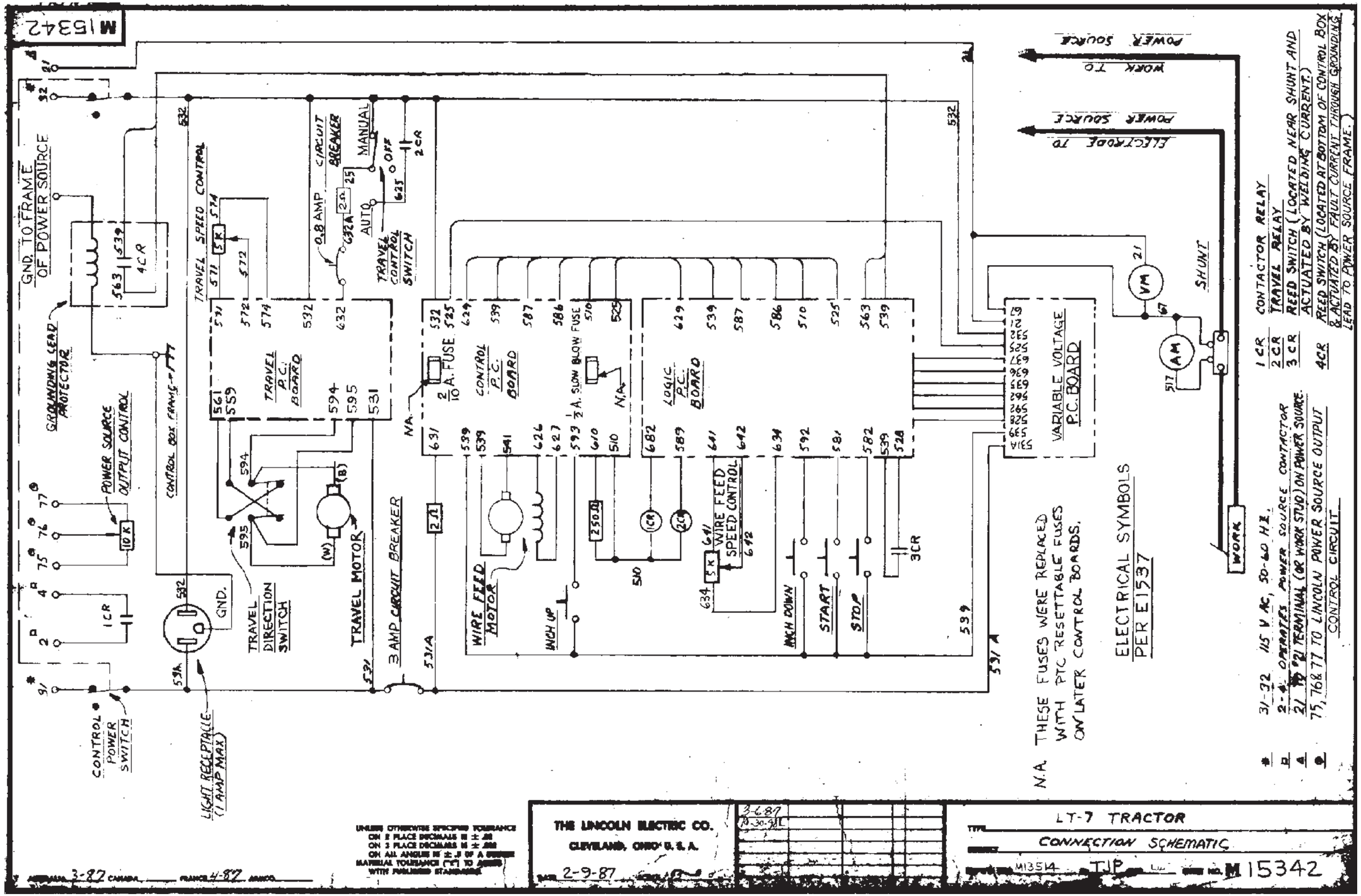
Return to Section TOC Return to Master TOC

CONNECTION DIAGRAM - CODES BELOW 9100 - M13514



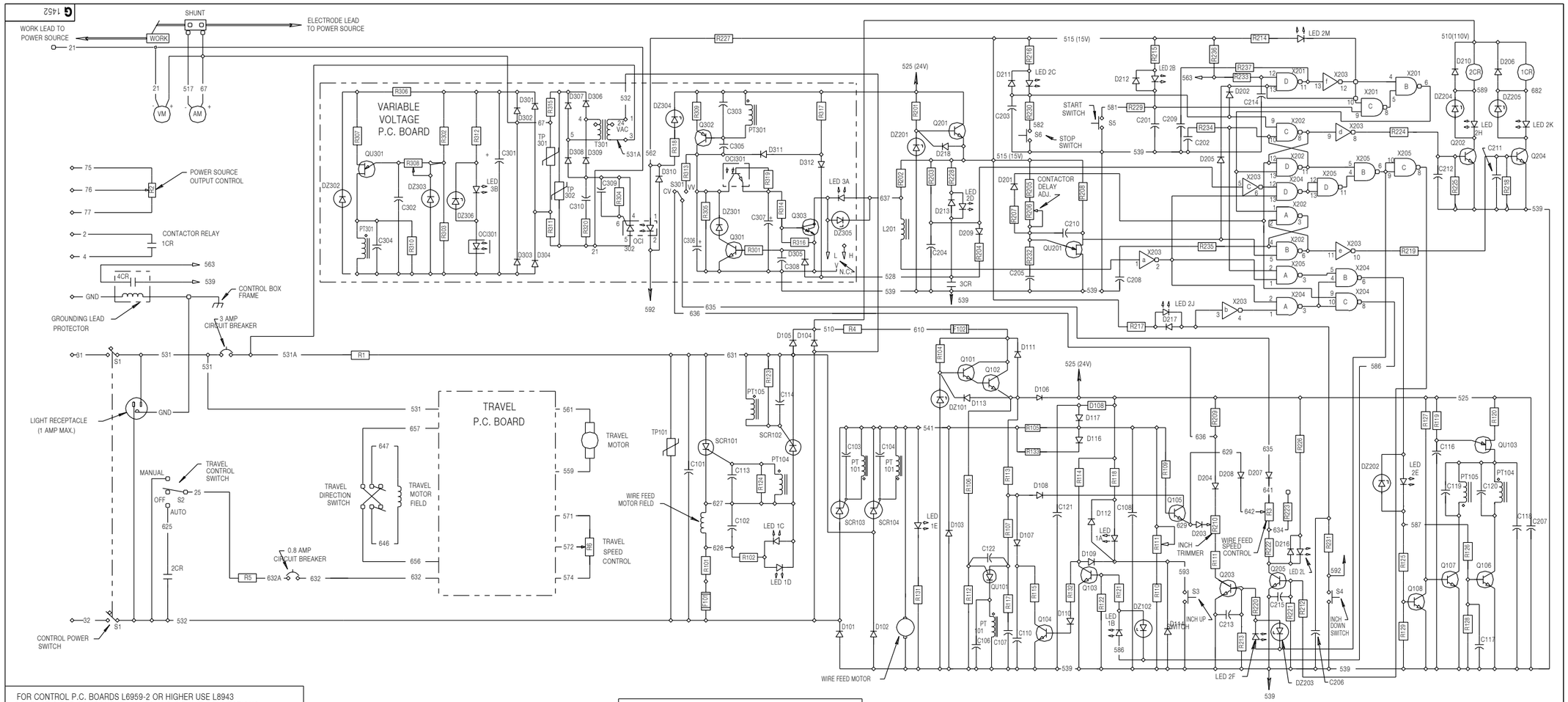
NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual. The wiring diagram specific to your code is pasted inside one of the enclosure panels of your machine.

CONNECTION DIAGRAM - CODES ABOVE 9100 - M15342



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual. The wiring diagram specific to your code is pasted inside one of the enclosure panels of your machine.

SCHEMATIC - COMPLETE MACHINE - CODES BELOW 9100 - G1452



FOR CONTROL P.C. BOARDS L6959-2 OR HIGHER USE L8943 SCHEMATIC FOR COMPONENT VALUES AND CIRCUIT CONNECTIONS.

CONTROL CIRCUIT

C101	.47 MFD	R101	80 OHM 12 W	Q101	2N5655
C102	50 MFD	R102	68K OHM	Q102	MJ3029
C103	.047 MFD	R104	10K OHM 2 W	Q103	2N4123
C104	.047 MFD	R105	39K OHM	Q104	2N4123
C106	.047 MFD	R106	4.7K OHM	Q105	2N4123
C107	.1 MFD	R107	15K OHM	Q106	2N5816
C108	1 MFD	R108	22K OHM	Q107	2N5816
C110	1 MFD	R109	10K OHM	Q108	2N4123
C113	.15 MFD	R110	1.5K OHM		
C114	.15 MFD	R111	5K OHM TRIMMER		
C116	.047 MFD	R112	4.7K OHM		
C117	.02 MFD	R113	22K OHM	QU101	2N6027
C118	.02 MFD	R114	10K OHM	QU103	UJT
C119	.02 MFD	R115	100 OHM		
C120	.02 MFD	R117	47 OHM		
C121	1 MFD	R118	6.8K OHM		
C122	.02 MFD	R119	6.8K OHM		
		R120	680 OHM	LED 1A	RED LIGHT EMITTING DIODE
D101	16 A	R121	2.7K OHM	LED 1B	
D102	16 A	R122	47K OHM	LED 1C	
D103 THRU D104 THRU D114 THRU D116 THRU D117	16 A, 1 A	R123	100 OHM	LED 1D	
		R124	100 OHM	LED 1E	
		R125	10K OHM		
		R126	680 OHM		
		R127	4.7K OHM	SCR101	8A 600V
		R128	47K OHM	SCR102	8A 600V
		R129	47K OHM	SCR103	12A 400V
DZ101	25V	R131	10K OHM 2 W	SCR104	12A 400V
DZ102	3V	R132	10K OHM		
		R133	27K OHM		

TP101	TRANSIENT PROTECTOR	PT101	PULSE TRANSFORMER
F101	1/2A SLOW BLOW FUSE	PT104	PULSE TRANSFORMER
F102	2/10A FUSE	PT105	PULSE TRANSFORMER

LOGIC CIRCUIT

C201	.02 MFD	R201	1.5K OHM	R234	470 OHM
C202	2 MFD	R202	4.7K OHM	R235	470 OHM
C203	.02 MFD	R203	15K OHM	R236	4.7K OHM
C204	10 MFD	R204	47 OHM	R237	330 OHM
C205	10 MFD	R205	10K OHM		
C206	.02 MFD	R206	50K OHM TRIMMER		
C207	50 MFD	R207	1.5K OHM		
C208	2 MFD	R208	1K OHM	X201	QUAD 2 INPUT NANDGATE
C209	4.7 MFD	R209	10K OHM		
C210 THRU C215	.02 MFD	R210	5K OHM TRIMMER	X202	QUAD 2 INPUT NANDGATE
		R211	1K OHM		
		R212	2.7K OHM	X203	HEX INVERTER
		R213	47K OHM	X204	QUAD 2 INPUT NANDGATE
D201 THRU D213 D216 D217 D218	1 A	R214	4.7K OHM		
		R215	4.7K OHM	X205	QUAD 2 INPUT NANDGATE
		R216	4.7K OHM		
		R217	4.7K OHM		
		R218	1.5K OHM		
LED 2B THRU LED 2F LED 2H LED 2J THRU LED 2M	RED LIGHT EMITTING DIODE	R219	2.7K OHM	L201	5.6mH
		R220	4.7K OHM		
		R221	1.5K OHM		
		R222	1K OHM		
		R223	10K OHM	DZ201 THRU DZ202 THRU DZ205	16V, 3V
		R224	2.7K OHM		
		R225	1.5K OHM		
		R226	6.8K OHM		
Q201	2N5655	R227	1.5K OHM		
Q202	2N5657	R228	4.7K OHM		
Q203	2N4123	R229	100 OHM		
Q204	2N5657	R230	100 OHM		
Q205	0.5A 300V	R231	100 OHM		
		R232	47 OHM		
QU201	UJT	R233	100 OHM		

VARIABLE VOLTAGE CIRCUIT

FOR VARIABLE VOLTAGE P.C. BOARDS L5394-2 OR HIGHER USE M16966 SCHEMATIC FOR COMPONENT VALUES AND CIRCUIT CONNECTIONS.

C301	2 MFD	R316	33K OHM		
C302	.1 MFD	R317	10K OHM		
C303	.01 MFD	R318	560 OHM		
C304	.02 MFD	R319	2.7M OHM		
C305	.01 MFD	R320	100 OHM		
C306	2 MFD				
C307	.47 MFD	LED 3A	RED LIGHT EMITTING DIODE		
C308	.22 MFD	LED 3B			
C309	.02 MFD				
C310	.01 MFD	OC1301	OPTO-ISOLATOR		
		OC1302	OPTO-ISOLATOR		
D301 THRU D304	1 A				
		Q301	2N4123		
D305 THRU D312	1 A	Q302	2N5815		
		Q303	MPS A13		
		QU301	UJT		
R301	47K OHM	TP301	TRANSIENT PROTECTOR		
R302	3.3K OHM 2 W	TP302	TRANSIENT PROTECTOR		
R303	6.8K OHM	PT301	PULSE TRANSFORMER		
R304	68K OHM	S301	SPDT TOGGLE SWITCH		
R305	100K OHM	T301	24V TRANSFORMER		
R306	4.7K OHM 2 W				
R307	100 OHM	DZ301	5.1V		
R308	10K OHM TRIMMER	DZ302	10V		
R309	15 OHM	DZ303	25V		
R310	75 OHM	DZ304	15V		
R311	68 OHM	DZ305	3V		
R312	5.6K OHM 2 W	DZ306	3V		
R313	6.8K OHM				
R314	10K OHM				
R315	1K OHM 12 W				

COMPONENTS NOT ON P.C. BOARD

R1	2 OHM 50 W
R2	10K OHM 2 W POWER SOURCE OUTPUT CONTROL
R3	5K OHM 2 W WIRE FEED SPEED CONTROL
R4	250 OHM 25 W
R5	2 OHM 25 W
R6	5K OHM 2 W TRAVEL SPEED CONTROL
S1	DPST CONTROL POWER SWITCH
S2	SPDT TRAVEL CONTROL SWITCH
S3	SPST INCH UP SWITCH
S4	SPST INCH DOWN SWITCH
S5	SPST START SWITCH
S6	SPST STOP SWITCH
S7	DPDT (REV.) TRAVEL DIRECTION SWITCH
1CR	SPST 110 VDC COIL
2CR	SPST 110 VDC COIL
3CR	REED SWITCH ACTUATED BY WELDING CURRENT
4CR	REED SWITCH ACTUATED BY FAULT CURRENT THRU GROUNDING LEAD TO POWER SOURCE FRAME.

A.N.S.I. ELECTRICAL SYMBOLS PER E1537.

N.A. TO OPERATE UNIT WITHOUT VARIABLE VOLTAGE BOARD JUMPER 637 TO 539 AND 635 TO 636.

N.B. X201 THRU X205 - PIN 7 CONNECTED TO 539, PIN 14 CONNECTED TO 515

N.C. WHEN CONTROLS ARE USED WITH R3S POWER SOURCES OF THE TYPE WHICH USES TAPS CONNECTED WITH A TRIANGLE PLATE FOR MAJOR VOLTAGE ADJUSTMENTS, JUMPER TO BE CONNECTED TO PIN "L". FOR ALL OTHER POWER SOURCES JUMPER TO BE CONNECTED TO PIN "H".

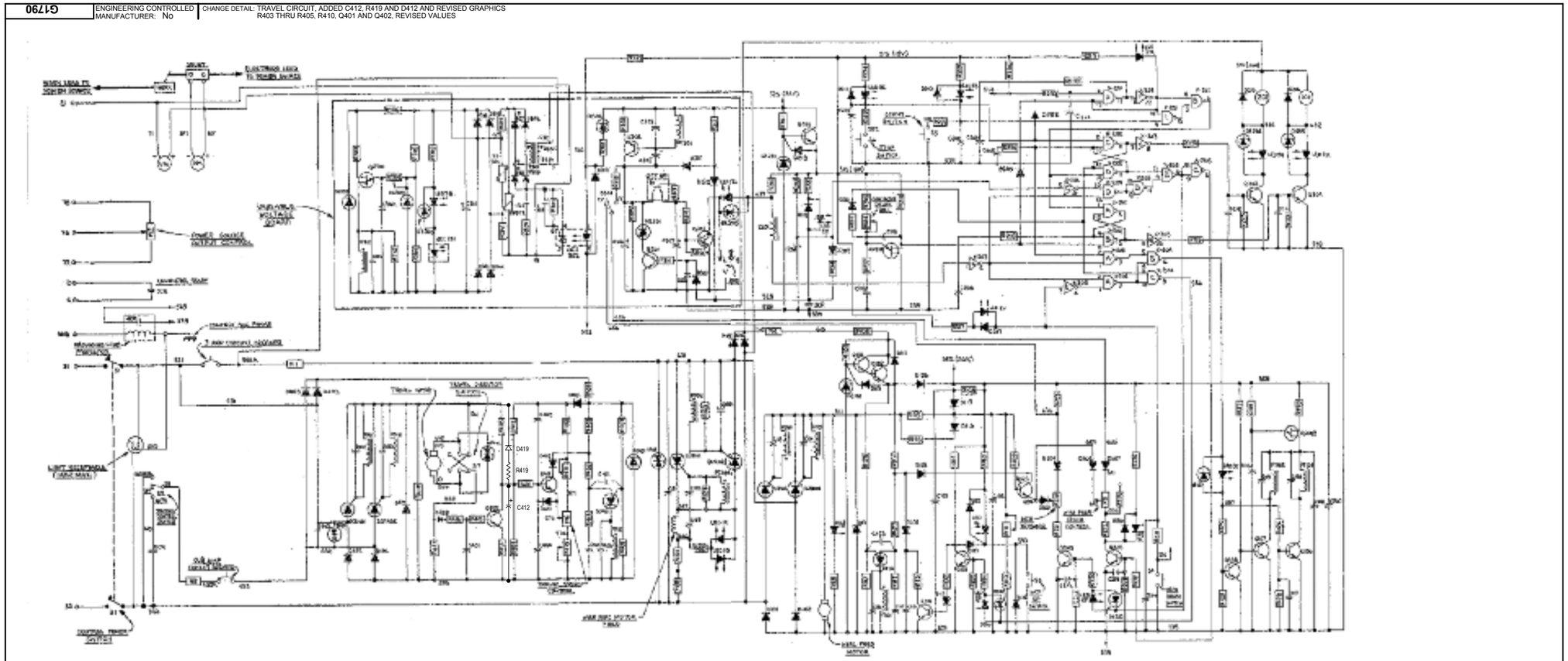
NOTE: SINCE COMPONENTS OR CIRCUITRY ON A PRINTED CIRCUIT BOARD MAY CHANGE WITHOUT AFFECTING THE INTERCHANGEABILITY OF A COMPLETE BOARD, THIS DIAGRAM MAY NOT SHOW THE EXACT COMPONENTS OR CIRCUITRY OF CONTROLS HAVING A COMMON CODE NUMBER.

THE LINCOLN ELECTRIC CO. CLEVELAND, OHIO U.S.A.
EQUIP. TYPE: LT-7 TRACTOR
SUBJECT: OPERATING SCHEMATIC
SCALE: NONE DR: DADULEY DATE: 6-4-97 CHK: THP REF. SUP'S'D'G: G1359 SHT. NO. G 1452

NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

Return to Section TOC
Return to Master TOC

SCHEMATIC - COMPLETE MACHINE - CODES ABOVE 9100 - G1790



FOR CONTROL P.C. BOARDS L6959-2 OR HIGHER USE L8943 SCHEMATIC
FOR COMPONENT VALUES AND CIRCUIT CONNECTIONS.

CONTROL CIRCUIT

C101	.47 MFD	R101	80O, 12W	R133	27K O
C102	50 MFD	R102	68K O		
C103	.047 MFD	R104	10K O, 2W	Q101	2N5655
C104	.047 MFD	R105	39K O	Q102	MJ3029
C106	.047 MFD	R106	4.7K O	Q103	2N4123
C107	.1 MFD	R107	15K O	Q104	2N4123
C108	1 MFD	R108	22K O	Q105	2N4123
C110	1 MFD	R109	10K O	Q106	2N5816
C113	.15 MFD	R110	1.5K O	Q107	2N5816
C114	.15 MFD	R111	5K O TRIMMER	Q108	2N4123
C116	.047 MFD	R112	4.7K O		
C117	.02 MFD	R113	22K O	QU101	2N6027
C118	.02 MFD	R114	10K O	QU103	UJT
C119	.02 MFD	R115	100 O		
C120	.02 MFD	R117	47 O	LED 1A	RED
C121	1 MFD	R118	6.8K O	LED 1B	LIGHT
C122	.02 MFD	R119	6.8K O	LED 1C	EMITTING
		R120	680 O	LED 1D	DIODE
D101	16 A	R121	2.7K O	LED 1E	
D102	16 A	R122	47K O		
D103	16 A	R123	100 O	SCR101	8A, 600 V.
D104	1 A	R124	100 O	SCR102	8A, 600 V.
THRU		R125	10K O	SCR103	12A, 400 V.
D114		R126	680 O	SCR104	12A, 400 V.
D116		R127	4.7K O		
D117		R128	47K O		
		R129	47K O		
DZ101	25 V	R131	10K O, 2W		
DZ102	3 V	R132	10K O		
TP101	TRANSIENT PROTECTOR	PT101	PULSE TRANSFORMER		
		PT104	PULSE TRANSFORMER		
F101	1/2A SLOW BLOW FUSE	PT105	PULSE TRANSFORMER		
F102	2/10 A FUSE				

FOR LOGIC P.C. BOARDS L5927-2 OR HIGHER USE L9015 SCHEMATIC
FOR COMPONENT VALUES AND CIRCUIT CONNECTIONS.

LOGIC CIRCUIT

C201	.02 MFD	QU201	UJT	R232	47.5 O
C202	2 MFD			R233	100 O
C203	.02 MFD	R201	1.5K O	R234	475 O
C204	10 MFD	R202	4.75K O	R235	475 O
C205	10 MFD	R203	15K O	R236	4.75 O
C206	.02 MFD	R204	47.5K O	R237	332 O
C207	50 MFD	R205	10K O		
C208	2 MFD	R206	50K O TRIMMER	X201	QUAD 2 INPUT NANDGATE
C209	4.7 MFD	R207	1.5K O	X2O2	QUAD 2 INPUT NANDGATE
C210		R208	1K O	X203	HEX INVERTER
THRU	.02 MFD	R209	10K O	X204	QUAD 2 INPUT NANDGATE
C215		R210	5K O TRIMMER	X205	QUAD 2 INPUT NANDGATE
		R211	1K O		
D201		R212	2.67K O	L201	5.6mH
THRU		R213	47.5K O		
D213	1A	R214	4.75K O	DZ201	16 V.
D216		R215	4.75K O	DZ202	
D217		R216	4.75K O	THRU	3 V.
D218		R217	4.75K O	DZ205	
		R218	1.5K O		
LED 2B		R219	2.67K O		
THRU	RED	R220	4.75K O		
LED 2F	LIGHT	R221	1.5K O		
LED 2H	EMITTING	R222	1K O		
LED 2J	DIODE	R223	10K O		
THRU		R224	2.67K O		
LED 2M		R225	1.5K O		
		R226	6.81K O		
Q201	2N5655	R227	1.5K O		
Q202	2N5657	R228	4.75K O		
Q203	2N4401	R229	100 O		
Q204	2N5657	R230	100 O		
Q205	.5 A, 300 V.	R231	100 O		

FOR VARIABLE VOLTAGE P.C. BOARDS L5394-2 OR HIGHER USE M16966
SCHEMATIC FOR COMPONENT VALUES AND CIRCUIT CONNECTIONS.

VARIABLE VOLTAGE CIRCUIT

C301	2 MFD	R316	33K O		
C302	.1 MFD	R317	10K O		
C303	.01 MFD	R318	560K O		
C304	.02 MFD	R319	2.7M O		
C305	.01 MFD	R320	100 O		
C306	.2 MFD				
C307	.47 MFD	LED 3A	RED LIGHT		
C308	.22 MFD	LED 3B	EMITTING DIODE		
C309	.02 MFD				
C310	.01 MFD	OCI301	OPTO-ISOLATOR		
		OCI302	OPTO-ISOLATOR		
D301					
THRU	1A	Q301	2N4123		
D304		Q302	2N5815		
D305		Q303	MPS-A13		
THRU	1A				
D312		QU301	UJT		
R301	47 K O	TP301	TRANSIENT PROTECTOR		
R302	3.3K O, 2W	TP302	TRANSIENT PROTECTOR		
R303	6.8K O				
R304	68K O	PT301	PULSE TRANSFORMER		
R305	100K O				
R306	4.7K O, 2W	S301	SPDT TOGGLE SWITCH		
R307	100 O				
R308	10K O TRIMMER	T301	24V. TRANSFORMER		
R309	15 O				
R310	75 O	DZ301	5.1V		
R311	68 O	DZ302	10V		
R312	5.6K O, 2W	DZ303	25V		
R313	6.8K O	DZ304	15V		
R314	10K O	DZ305	3V		
R315	1K O, 12W	DZ306	3V		

TRAVEL CIRCUIT

C401	2 MFD	D401	1 A		
C402	10 MFD	D402	1 A, 1000V		
C403	.005 μ F	D403	1 A, 1000V		
C404	10 MFD	D404	16 A		
C405	.1 MFD	D405	16 A		
C406	.01 MFD	D406	16 A		
C407	.047 MFD	D409	1 A		
C408	.047 MFD	D410	1 A		
C411	.02 MFD	D411	1 A		
C412	1 MFD	D412	1 A		
R401	10 K O	TP401	TRANSIENT PROTECTOR		
R402	22K O	TP402	TRANSIENT PROTECTOR		
R403	2.7K O				
R404	162 O	PT401	1:1:1 PULSE TRANSFORMER		
R405	1.5K O, 15W				
R406	15K O	DZ401	20 V		
R407	4.7K O				
R408	4.7K O, 4W	SCR401	12A 400V SCR		
R409	4.7K O	SCR402	12A 400V SCR		
R410	1K O TRIMMER				
R411	20K O TRIMMER	Q401	2N4401		
R412	27K O	Q402	2N4401		
R413	47K O				
R414	2.2K O	QU401	2N6027		
R415	10K O				
R416	10K O				
R417	2.7K O, 4W				
R418	2.5K O, 5W				
R419	3.3K O				

COMPONENTS NOT ON P.C. BOARD

R1	2 O, 50W
R2	10K O, 2W POWER SOURCE OUTPUT CONTROL
R3	5K O, 2W WIRE FEED SPEED CONTROL
R4	250 O, 25W
R5	2 O, 25W
R6	5K O, 2W TRAVEL SPEED CONTROL
S1	DPST CONTROL POWER SWITCH
S2	SPDT TRAVEL CONTROL SWITCH
S3	SPST INCH UP SWITCH
S4	SPST INCH DOWN SWITCH
S5	SPST START SWITCH
S6	SPST STOP SWITCH
S7	DPDT (REV.) TRAVEL DIRECTION SWITCH
1CR	SPST, 110 VDC COIL
2CR	SPST, 110 VDC COIL
3CR	REED SWITH ACTUATED BY WELDING CURRENT
4CR	REED SWITH ACTUATED BY FAULT CURRENT THRU GROUNDING LEAD TO POWER SOURCE FRAME.

ELECTRICAL SYMBOLS PER E1537

NOTES:

N.A. TO OPERATE UNIT WITHOUT VARIABLE VOLTAGE BOARD JUMPER 637 TO 539 AND 635 TO 636.

N.B. X201 THRU X205 - PIN 7 CONNECTED TO 539
- PIN 14 CONNECTED TO 515

N.C. WHEN CONTROLS ARE USED WITH RSS POWER SOURCES OF THE TYPE WHICH USES TAPS CONNECTED WITH TRIANGLE PLATE FOR MAJOR VOLTAGE ADJUSTMENTS, JUMPER TO BE CONNECTED TO PIN "L". FOR ALL OTHER POWER SOURCES JUMPER TO BE CONNECTED TO PIN "H".

NOTE: SINCE COMPONENTS OR CIRCUITRY ON A PRINTED CIRCUIT BOARD MAY CHANGE WITHOUT AFFECTING THE INTERCHANGEABILITY OF A COMPLETE BOARD, THIS DIAGRAM MAY NOT SHOW THE EXACT COMPONENTS OR CIRCUITRY OF CONTROLS HAVING A COMMON CODE NUMBER.

UNLESS OTHERWISE SPECIFIED TOLERANCE ON 2 PLACE DECIMALS IS ± .02 in. (± 0.5 mm) ON 3 PLACE DECIMALS IS ± .002 in. (± 0.05 mm) ON ALL ANGLES IS ± .5 OF A DEGREE. MATERIAL TOLERANCE ("t") TO AGREE WITH PUBLISHED STANDARDS. DO NOT SCALE THIS DRAWING

CONTROL: CLEVELAND
DRAWN BY: fivory
ENGINEER: -
APPROVED: -

SCALE: NONE IF PRINTED @ A1 SIZE
UNITS: INCH

EQUIPMENT TYPE: LT-7 TRACTOR
SUBJECT: OPERATING SCHEMATIC
MATERIAL DISPOSITION: UF
APPROVAL DATE: 2-15-2008
PROJECT NUMBER: CRM37981
REFERENCE: -

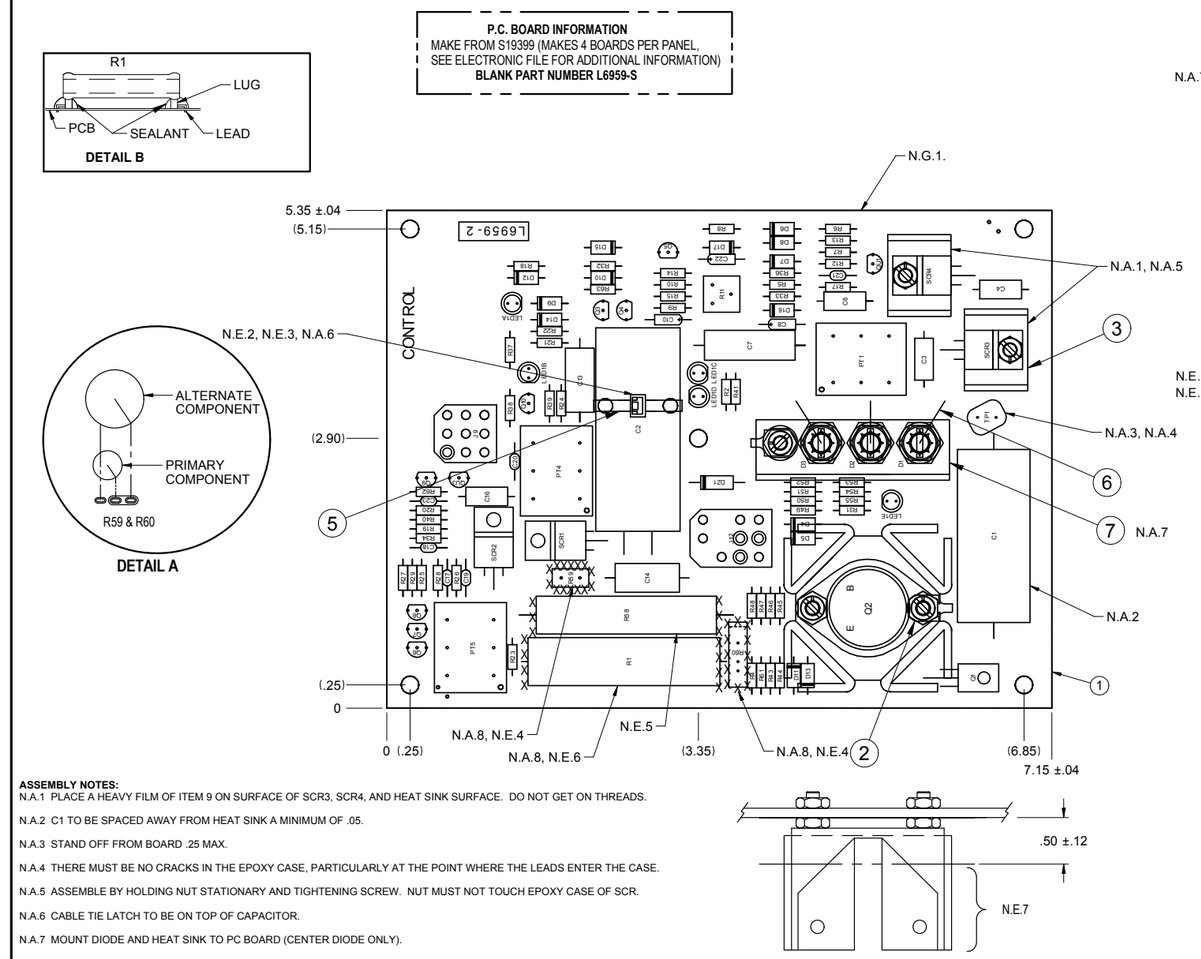
PAGE 1 OF 1
DOCUMENT NUMBER: G1790
DOCUMENT REVISION: B

NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

Return to Section TOC
Return to Master TOC

PC BOARD ASSEMBLY - CONTROL BOARD - L6959-2

L6959-2 | ENGINEERING CONTROLLED MANUFACTURER: No | CHANGE DETAIL: CALLED OUT NOTE N.G.1



ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	SEE BLANK INFO	PC BOARD BLANK
2	2	CF000005	#6-32HN
3	2	S14008-7	HEAT SINK,
	2	CF000003	#6-32 X .375RHS
	2	E106A-13	LOCK WASHER
	2	T13746	#6-32HN - NICKEL
4	.5 OZ.	E2861	SEALANT
5	1	T13770-2	CABLE TIE
6	3	E2387-#20-2.00	JUMPER
N.A.7 7	1	S14367-1	DIODE & HEATSINK ASSEMBLY
	1	CF000354	#10-32HN
9	AS REQ'D	E1868	THERMAL COMPOUND

REFER TO ELECTRONIC COMPONENT DATABASE FOR SPECIFICATIONS ON ITEMS LISTED BELOW

REFERENCES	QTY	PART NUMBER	DESCRIPTION
C1	1	S13490-1	CAPACITOR,POLYESTER FILM,PEF,0.47MF,400V,10%,RIDID
C2	1	S13490-86	CAPACITOR,ALEL,50,250VNP,+30/-10%
C3, C4, C6, C16	4	S13490-102	CAPACITOR,PEMF,.047,100V,10%
C7	1	T11577-26	CAPACITOR,PEF,0.1,100V,10%
C8, C10, C22	3	S13490-42	CAPACITOR,TAEL,1.0,35V,10%
C13, C14	2	S13490-96	CAPACITOR,PEMF,0.15,200V,10%
C17, C18, C19, C20, C21, C23	6	S16668-5	CAPACITOR,CEMO,.022,50V,20%
D4, D5	2	T12199-2	DIODE,AXLDS,1A,1000V
D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, D16, D17	12	T12199-1	DIODE,AXLDS,1A,400V
DZ1	1	T12702-41	ZENER DIODE,5W,24V,5%,1N5359B
N.E.1 J9	1	T13160-64	CONNECTOR,PCB,PLUG,9-PIN
N.E.1 J12	1	T13160-22	CONNECTOR,PCB,PLUG,12-PIN
LED1A, LED1B, LED1C, LED1D, LED1E	5	T13657-2	LED,T-1,3/4,RED,HLMP-3003
PT1, PT4, PT5	3	T12737-2	TRANSFORMER,PULSE,3-WINDING,1:1:1
Q1	1	T12704-16M3A	TRANSISTOR,NPN,T225,0.5A,250V,2N5655
Q2	1	S15306	TRANSISTOR
Q3, Q4, Q5, Q6, Q7, Q8, Q9, Q10	8	T12704-68	TRANSISTOR,NPN,TO226,0.5A,40V,2N4401
QU1, QU3	2	T12707-4	TRANSISTOR,PUT,TO92,2N6027
R1	1	T12300-88	RESISTOR,WW,20W,50,5%
R2, R41	2	S19400-1333	RESISTOR,MF,1/4W,133K,1%
R4, R31, R43, R44, R45, R46, R47, R48, R49, R50, R51, R52, R53, R54, R55, R61	16	S19400-2002	RESISTOR,MF,1/4W,20.0K,1%
R5, R8, R13	3	S19400-2212	RESISTOR,MF,1/4W,22.1K,1%
R6, R12, R27	3	S19400-4751	RESISTOR,MF,1/4W,4.75K,1%
R7	1	S19400-1502	RESISTOR,MF,1/4W,15.0K,1%
R9, R14, R22, R25, R32, R38, R63	7	S19400-1002	RESISTOR,MF,1/4W,10.0K,1%
R10, R34	2	S19400-1501	RESISTOR,MF,1/4W,1.50K,1%
R11	1	T10812-36	TRIMMER,ST,1/2W,5K, 10%,LINEAR
R15, R23, R24	3	S19400-1000	RESISTOR,MF,1/4W,100,1%
R17	1	S19400-47R5	RESISTOR,MF,1/4W,47.5,1%
R18, R19, R21, R37, R39	5	S19400-6811	RESISTOR,MF,1/4W,6.81K,1%
R20	1	S19400-1372	RESISTOR,MF,1/4W,13.7K,1%
R26	1	S19400-6810	RESISTOR,MF,1/4W,681,1%
R28, R29	2	S19400-4752	RESISTOR,MF,1/4W,47.5K ,1%
R33	1	S19400-2672	RESISTOR,MF,1/4W,26.7K,1%
R36	1	S19400-1782	RESISTOR,MF,1/4W,17.8K,1%
R40	1	S19400-3322	RESISTOR,MF,1/4W,33.2K,1%
R58	1	S24376-1	RESISTOR,WW,10W,30,5%
R59	1	S18380-8	THERMISTOR,PTC,6.7OHMS,320MA
R60	1	S18380-13	THERMISTOR,PTC,2.9OHMS,0.600A
R62	1	S19400-3320	RESISTOR,MF,1/4W,332,1%
SCR1, SCR2	2	S15161-14	SCR,TO220,12A,600V,2N6398
SCR3, SCR4	2	S15161-6	SCR,TO220,12A,400V,2N6397
TP1	1	T13640-14	MOV,150VRMS,13J,7MM

ASSEMBLY NOTES:

N.A.1 PLACE A HEAVY FILM OF ITEM 9 ON SURFACE OF SCR3, SCR4, AND HEAT SINK SURFACE. DO NOT GET ON THREADS.

N.A.2 C1 TO BE SPACED AWAY FROM HEAT SINK A MINIMUM OF .05.

N.A.3 STAND OFF FROM BOARD .25 MAX.

N.A.4 THERE MUST BE NO CRACKS IN THE EPOXY CASE, PARTICULARLY AT THE POINT WHERE THE LEADS ENTER THE CASE.

N.A.5 ASSEMBLE BY HOLDING NUT STATIONARY AND TIGHTENING SCREW. NUT MUST NOT TOUCH EPOXY CASE OF SCR.

N.A.6 CABLE TIE LATCH TO BE ON TOP OF CAPACITOR.

N.A.7 MOUNT DIODE AND HEAT SINK TO PC BOARD (CENTER DIODE ONLY).

N.A.8 COMPONENT TO BE PERPENDICULAR TO THE PCB AND MOUNTED AS SHOWN IN DETAIL A.

N.A.9 MOUNT COMPONENT WITH THE RESISTOR LUGS AGAINST THE PC BOARD AS SHOWN IN DETAIL B.

ENCAPSULATION NOTES:

N.E.1 DO NOT COAT WITH ENCAPSULATION MATERIAL.

N.E.2 COAT CABLE TIE AROUND CAPACITOR WITH ENCAPSULATION MATERIAL.

N.E.3 ENCAPSULATION MATERIAL TO FLOW UNDER CAPACITOR.

N.E.4 BEFORE ENCAPSULATION, PLACE A BEAD OF ITEM 4 TO COVER THE LEADS UP TO THE BOTTOM OF THE COMPONENT, BUT NOT COVERING MORE THAN 10% OF THE COMPONENT SURFACE.

N.E.5 BEFORE ENCAPSULATION, PLACE A BEAD OF ITEM 4 TO COVER THE LEADS AND ENDS OF THE COMPONENT. COMPONENT TO BE MOUNTED AGAINST THE PC BOARD.

N.E.6 COMPLETELY COVER THE LEADS, LUGS, AND LOWER ENDS OF THE RESISTOR WITH ITEM 4. SEE DETAIL B.

N.E.7 DO NOT COAT HEATSINK WITH ENCAPSULATION MATERIAL .50 ± .12 ABOVE COMPONENT SIDE SURFACE. ENCAPSULATION MATERIAL MAY RUN INTO RESTRICTED AREA, BUT NO MORE THAN 10% OF SURFACE AREA MAY BE COVERED.

GENERAL NOTES:

N.G.1 **CAUTION:** THIS ASSEMBLY IS SUBJECT TO DAMAGE BY STATIC ELECTRICITY. SEE E2454 BEFORE HANDLING.

MAKE PER E1911
ENCAPSULATE WITH E1844
TEST PR E2209-C
SCHEMATIC REFERENCE: L8943-2S0

MANUFACTURED AS:

L6959-2S0

IDENTIFICATION CODE

CAPACITORS = MFD/VOLTS
RESISTORS = OHMS

FOR PARTS ORDERS:

SEAL TRIMMER ADJUSTING SCREW WITH A DROP OF E4018 AFTER PROPER TRIMMING HAS BEEN DONE.
INCLUDE T11590-90 AND S24590-1PRINT.

MANUFACTURING TOLERANCE PER E2056 UNLESS OTHERWISE SPECIFIED TOLERANCE: ON 2 PLACE DECIMALS IS ± .02 in. (± 0.5 mm) ON 3 PLACE DECIMALS IS ± .002 in. (± 0.05 mm) ON ALL ANGLES IS ± .5 OF A DEGREE MATERIAL TOLERANCE ("t") TO AGREE WITH PUBLISHED STANDARDS

DO NOT SCALE THIS DRAWING

CONTROL: CLEVELAND
DRAWN BY: fivory
ENGINEER: -
APPROVED: DRS

SCALE: 1:1 IF PRINTED @ A2 SIZE

UNITS: INCH

EQUIPMENT TYPE: LT TRACTOR

SUBJECT: CONTROL P.C. BOARD ASSEMBLY

MATERIAL DISPOSITION: UF | APPROVAL DATE: - | PROJECT NUMBER: CRM41787 | REFERENCE: -

PAGE 1 OF 1

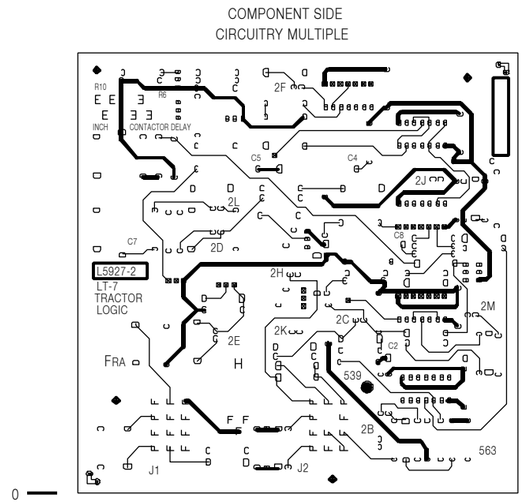
DOCUMENT NUMBER: **L6959-2**

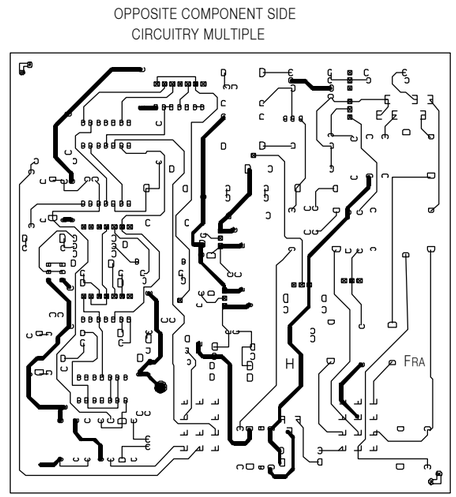
DOCUMENT REVISION: **H.01**

NOTE: Lincoln Electric assumes no responsibility for liablilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.

Return to Section TOC
Return to Master TOC

PC BOARD ASSEMBLY - LOGIC BOARD - L5927-2





MAKE FROM S19399
(MAKES 6 BOARDS)

BLANK PART NO. L5927-F

NOTE: FOR BLANK SHEARING TOLERANCE SEE P.C. BOARD ASSEMBLY.

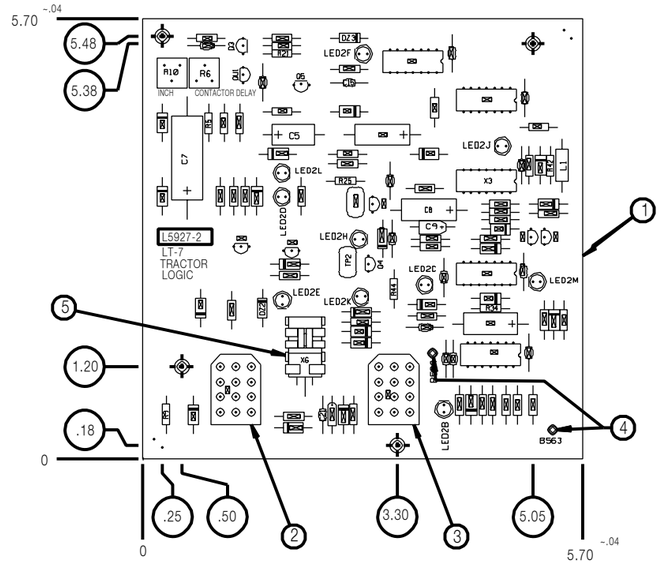
	ITEM	REQ'D	PART NO.	IDENTIFICATION
	C1, C3, C6, C10, C11, C12, C13 C14, C15, C16, C17, C18, C19 C20, C21	15	S16668-5	.022/50
	C2, C8	2	S13490-67	2/50
	C4	1	S13490-12	10/25
	C5	1	S13490-93	27/35
	C7	1	S13490-72	50/50
	C9	1	S13490-25	4.7/35
	C22	1	S13490-42	1.0/35
	D1, D2, D3, D4, D5, D6, D7, D8, D9 D10, D11, D12, D13, D16, D17 D20, D21, D22, D23, D24, D25	21	T12199-1	1N4004
	DZ2, DZ3, DZ4, DZ5	4	T12702-53	1N4728A
	L1	1	T12218-2	5.6mH
	LED2B, LED2C, LED2D, LED2E LED2F, LED2H, LED2J, LED2K LED2L, LED2M	10	T13657-2	RED LED
	Q2, Q4, Q5	3	T12704-35	NPN TRANSISTOR
	Q3, Q6, Q7, Q9	4	T12704-68	2N4401
	Q8	1	T12704-69	2N4403
	Q11	1	T12707-4	2N6027
	R2, R14, R15, R16, R17, R20, R28 R36, R40, R42, R44, R45	12	S19400-4751	4.75K
	R3	1	S19400-1502	15K 1/4W
	R4, R29, R30, R31, R33, R41	6	S19400-1000	100 1/4W
	R5, R9, R23	3	S19400-1002	10K 1/4W
	R6	1	T10812-41	10K 1/2W TRIMMER
	R7, R27, R38, R43, R47, R48	6	S19400-1501	1.5K 1/4W
	R8	1	S19400-7681	7.68K 1/4W
N.A.	R10	1	T10812-36	5K 1/2W TRIMMER
	R11, R22, R46	3	S19400-1001	1K 1/4W
	R12, R19, R24	3	S19400-5621	5.62K 1/4W
	R13	1	S19400-4752	47.5K 1/4W
	R18, R21, R25	3	S19400-1003	100K 1/4W
	R26	1	S19400-6811	6.81K 1/4W
	R32	1	S19400-3922	39.2K 1/4W
	R34, R35	2	S19400-4750	475 1/4W
	R37, R39	2	S19400-3320	332 1/4W
	TP1, TP2	2	T13640-14	MOV
N.B.	X1, X2, X4, X5	4	S15018-3	4011B
N.B.	X3	1	S15018-4	HEX INVERTER
	X6	1	S15128-6	15V REG.

RESISTORS = OHMS

CAPACITORS = MFD/VOLTS

	ITEM	REQ'D	PART NO.	DESCRIPTION
N.A.	1	1	L5927-F	PC. BOARD BLANK
N.A.	2	1	T13160-30	HEADER (J1)
N.A.	3	1	T13160-31	HEADER (J2)
N.A.	4	2	T13157-2	TERMINAL (B539, B563)
	5	1	S20590-1	HEAT SINK

THE LINCOLN ELECTRIC CO.
CLEVELAND, OHIO U.S.A.
LT TRACTORS
LOGIC P.C. BOARD ASSEMBLY
L 5927-2



MANUFACTURED AS:

L5927-2F1

IDENTIFICATION CODE

MAKE PER E1911
ENCAPSULATE WITH E1844
TEST PER E2209-L

NOTES:

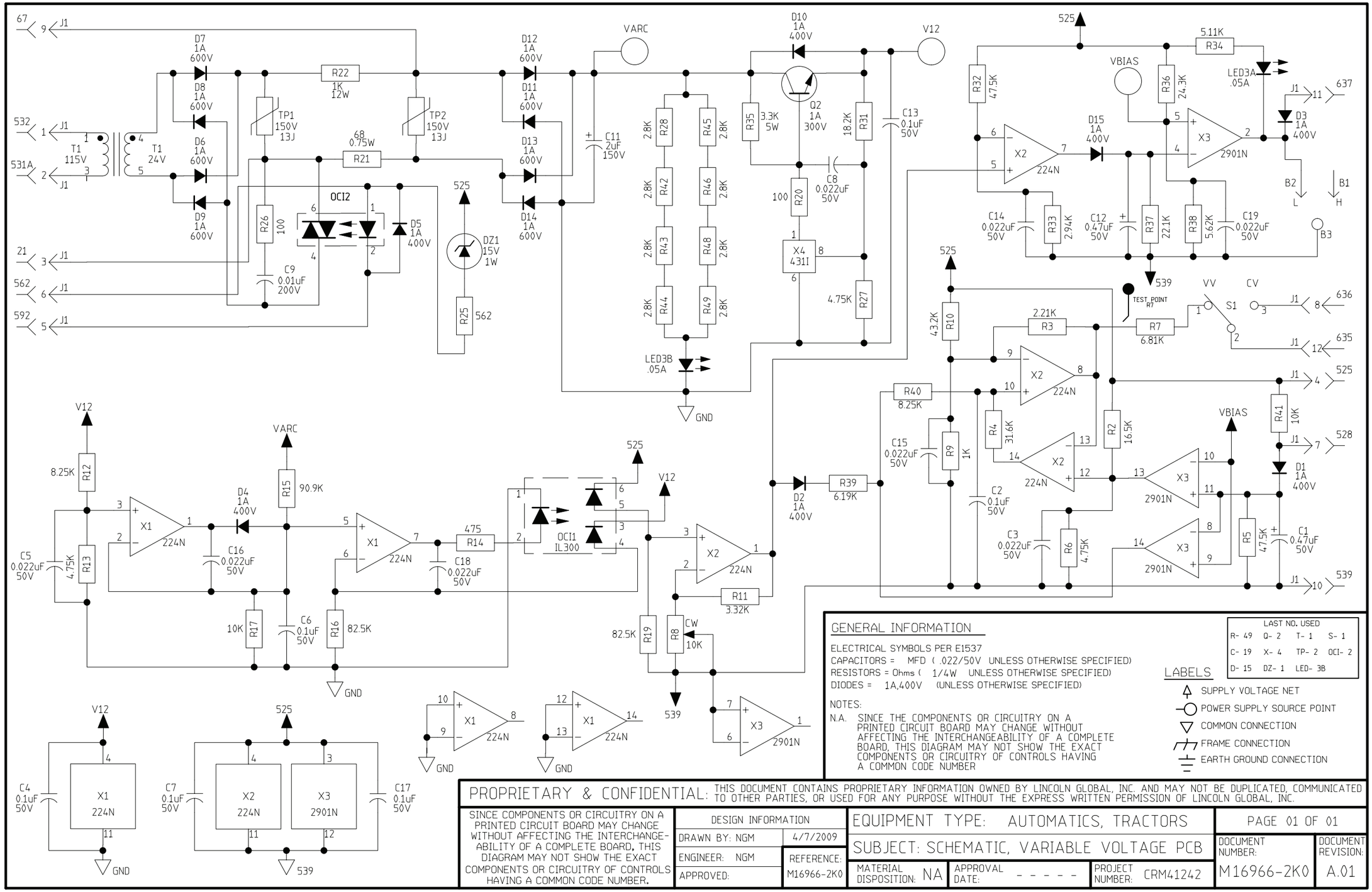
N.A. DO NOT COAT WITH ENCAPSULATION MATERIAL.

N.B. **CAUTION** THIS DEVICE IS SUBJECT TO DAMAGE BY STATIC ELECTRICITY. SEE E2454 BEFORE HANDLING.

L 5927-2

NOTE: Lincoln Electric assumes no responsibility for liablilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.

SCHEMATIC - VARIABLE VOLTAGE BOARD - M16966-2K0



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC

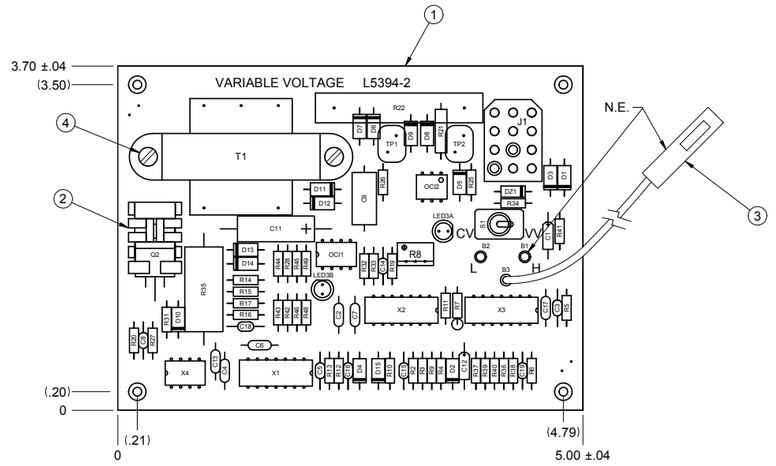
PC BOARD ASSEMBLY - VARIABLE VOLTAGE BOARD - L5394-2

L5394-2 | ENGINEERING CONTROLLED MANUFACTURER: No | CHANGE DETAIL: REVISED OCI2, BLANK, MANUAFACTURED AS, IDENTIFICATION CODE AND SCHEMATIC REFERENCE PART NUMBERS REMOVED C10 CAPACITOR AND R24 RESISTOR

P.C. BOARD BLANK INFORMATION

MAKE FROM S19399 (MAKES 9 BOARDS PER PANEL, SEE ELECTRONIC FILE FOR ADDITIONAL INFORMATION)

BLANK PART NUMBER L5394-K



	ITEM (USED WITH)*	QTY	PART NUMBER	DESCRIPTION
	1	1	L5394-K	PC BOARD BLANK
	2 (Q2)*	1	S20590-1	HEAT SINK,SLIP ON,FOR TO-220
N.A.	3	1	S14165-204	PLUG AND LEAD ASSEMBLY
	4	2	CF000048	#8-32X.25RHS
		2	CF000042	#8-32HN
	REFER TO ELECTRONIC COMPONENT DATABASE FOR SPECIFICATIONS ON ITEMS LISTED BELOW			
	REFERENCES	**QTY**	**PART NUMBER**	**DESCRIPTION**
N.A.	B1, B2	2	T13157-2	CONNECTOR,BEAD PIN,PCB,MALE,TIN
	C1, C12	2	S13490-63	CAPACITOR,TAEL,.47,50V,10%
	C2, C4, C6, C7, C13, C17	6	S16668-11	CAPACITOR,CEMO,0.1, 50V,10%
	C3, C5, C8, C14, C15, C16, C18, C19	8	S16668-5	CAPACITOR,CEMO,.022,50V,20%
	C9	1	T11577-32	CAPACITOR,PEF,.01,200V,10%
	C11	1	S13490-68	CAPACITOR,ALEL,2,150V,+75/-10%
	D1, D2, D3, D4, D5, D10, D15	7	T12199-1	DIODE,AXLDS,1A,400V
	D6, D7, D8, D9, D11, D12, D13, D14	8	T12199-4	DIODE,AXLDS,1A,600V
	DZ1	1	T12702-29	ZENER DIODE,1W,15V,5%,1N4744A
N.A.	J1	1	T13160-27	CONNECTOR,PCB,PLUG,12-PIN
	LED3A, LED3B	2	T13657-2	LED,T-1,3/4,RED,HLMP-3003
	OCI1	1	S15000-21	OPTOCOUPLER,PHOTODIODE,LINEAR,IL300
	OCI2	1	S15000-30	OPTOCOUPLER,TRIAC,DRV,RANDOM,60mA,800V
	Q2	1	T12704-40	TRANSISTOR,N,TO220,1A,300V,TIP48
	R2	1	S19400-1652	RESISTOR,MF,1/4W,16.5K,1%
	R3	1	S19400-2211	RESISTOR,MF,1/4W,2.21K,1%
	R4	1	S19400-3162	RESISTOR,MF,1/4W,31.6K,1%
	R5, R32	2	S19400-4752	RESISTOR,MF,1/4W,47.5K ,1%
	R6, R13, R27	3	S19400-4751	RESISTOR,MF,1/4W,4.75K,1%
	R7	1	S19400-6811	RESISTOR,MF,1/4W,6.81K,1%
	R8	1	S16296-5	TRIMMER,MT,1/2W,10K, 10%,LINEAR
	R9	1	S19400-1001	RESISTOR,MF,1/4W,1.00K,1%
	R10	1	S19400-4322	RESISTOR,MF,1/4W,43.2K,1%
	R11	1	S19400-3321	RESISTOR,MF,1/4W,3.32K,1%
	R12, R40	2	S19400-8251	RESISTOR,MF,1/4W,8.25K,1%
	R14	1	S19400-4750	RESISTOR,MF,1/4W,475,1%
	R15	1	S19400-9092	RESISTOR,MF,1/4W,90.9K,1%
	R16, R19	2	S19400-8252	RESISTOR,MF,1/4W,82.5K,1%
	R17, R41	2	S19400-1002	RESISTOR,MF,1/4W,10.0K,1%
	R20, R26	2	S19400-1000	RESISTOR,MF,1/4W,100,1%
	R21	1	S24000-68R0	RESISTOR,WW,3/4W,68,5%
N.D.	R22	1	T12300-6	RESISTOR,WW,12W,1K,5%
	R25	1	S19400-5620	RESISTOR,MF,1/4W,562,1%
	R28, R42, R43, R44, R45, R46, R48, R49	8	S19400-2801	RESISTOR,MF,1/4W,2.80K,1%
	R31	1	S19400-1822	RESISTOR,MF,1/4W,18.2K,1%
	R33	1	S19400-2941	RESISTOR,MF,1/4W,2.94K,1%
	R34	1	S19400-5111	RESISTOR,MF,1/4W,5.11K,1%
	R35	1	T14648-5	RESISTOR,WW,5W,3.3K,5%,SQ
	R36	1	S19400-2432	RESISTOR,MF,1/4W,24.3K,1%
	R37	1	S19400-2212	RESISTOR,MF,1/4W,22.1K,1%
	R38	1	S19400-5621	RESISTOR,MF,1/4W,5.62K,1%
	R39	1	S19400-6191	RESISTOR,MF,1/4W,6.19K,1%
N.A., N.C.	S1	1	T13381	SWITCH,TOGGLE,SPDT
	T1	1	S13000-31	TRANSFORMER,PCB;115V;24V,185MA
N.B.	TP1, TP2	2	T13640-14K	MOV,150VRMS,13J,7MM
	X1, X2	2	S15128-4	OP-AMP,QUAD, GEN-PURPOSE,224N
	X3	1	S15128-11	IC,COMPARATOR,QUAD,2901N
	X4	1	S15128-10	VOLTAGE REF,ADJ, PRECISION,431I

NOTES:

N.A. DO NOT COAT WITH ENCAPSUATION MATERIAL.

N.B. STAND OFF FROM BOARD .25 MAXIMUM. INSPECT BEFORE AND AFTER ENCAPSULATION. THERE MUST BE NO CRACKS IN THE EPOXY CASE, PARTICULARLY AT THE POINT WHERE THE LEADS ENTER THE CASE.

N.C. DO NOT EXPOSE TO CLEANING SOLVENT OR VAPORS.

N.D. RESISTOR TABS TO BE IN CONTACT WITH P.C. BOARD.

N.E. JUMPER PLUG MUST BE CONNECTED TO PIN H AFTER ENCAPSULATION.

MANUFACTURED AS:

L5394-2K0

IDENTIFICATION CODE

CAPACITORS = MFD/VOLTS
RESISTORS = OHMS

MAKE PER E1911
ENCAPSULATE WITH E1844
TEST PER E2157-V
SCHEMATIC REFERENCE: M16966-2K0

FOR PARTS ORDERS:

- TRIMMER ADJUSTING SCREW MUST BE SEALED WITH A DROP OF E4018.
- INCLUDE T14164PRINT AND T11590-90 TAG.

MANUFACTURING TOLERANCE PER E2056
UNLESS OTHERWISE SPECIFIED TOLERANCE:
ON 2 PLACE DECIMALS IS ± .02 in. (± 0.5 mm)
ON 3 PLACE DECIMALS IS ± .002 in. (± 0.05 mm)
ON ALL ANGLES IS ± .5 OF A DEGREE
MATERIAL TOLERANCE (*1*) TO AGREE WITH PUBLISHED STANDARDS
DO NOT SCALE THIS DRAWING

CONTROL: CLEVELAND
DRAWN BY: fivory
ENGINEER:
APPROVED: DRS

SCALE: 1:1 IF PRINTED @ A2 SIZE
UNITS: INCH

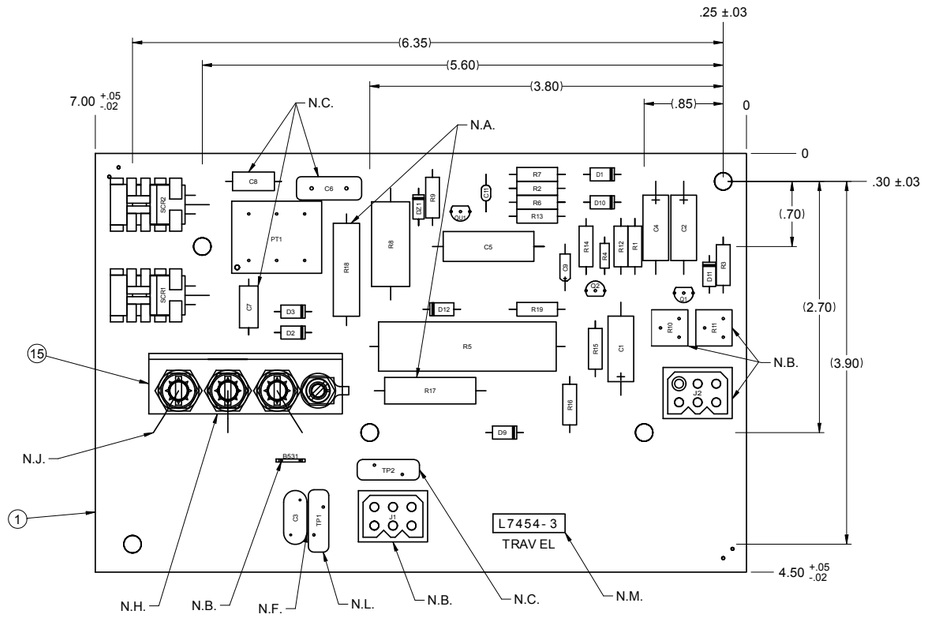
EQUIPMENT TYPE: AUTOMATICS
SUBJECT: VARIABLE VOLTAGE P.C. BOARD ASSEMBLY
MATERIAL DISPOSITION: UF
APPROVAL DATE: 6-19-2009
PROJECT NUMBER: CRM41242
REFERENCE: -

PAGE 1 OF 1
DOCUMENT NUMBER: L5394-2
DOCUMENT REVISION: E

NOTE: Lincoln Electric assumes no responsibility for liablilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.

PC BOARD ASSEMBLY - TRAVEL BOARD - L7454-3

L7454-3 | ENGINEERING CONTROLLED MANUFACTURER: No | CHANGE DETAIL: NEW



ITEM (USED WITH)*	QTY	PART NUMBER	DESCRIPTION
1	1	L7454-B	PC BOARD BLANK
5 *	1	CF000354	10-32 HEX NUT 3445
8 *	AS REQ	E2387-2	UNINSULATED SOLID TINNED COPPER WIRE,20AWG
10 (SCR1, SCR2)*	2	S20590-1	HEAT SINK,SLIP ON,FOR TO-220
15	1	S14367-1	DIODE AND HEATSINK ASSEMBLY
N.M. 16	1	E3768-4	LABEL .25 x 2.50

REFER TO ELECTRONIC COMPONENT DATABASE FOR SPECIFICATIONS ON ITEMS LISTED BELOW

REFERENCES	QTY	PART NUMBER	DESCRIPTION
B531	1	T13157-14	CONNECTOR,TAB,QC,VERTICAL,1/4,REEL
C1	1	S13490-67	CAPACITOR,ALEL,2,50V,+75/-10%
C2, C4	2	S13490-12	CAPACITOR,ALEL,10,25V,+75/-10%
C3	1	T11577-52K	CAPACITOR,CD,.0047/.005,1400V,20%
C5	1	T11577-26	CAPACITOR,PEF,0.1,100V,10%
C6	1	S13490-31	CAPACITOR,PEF,0.01MF,100V,10%,RADIAL
C7, C8	2	S13490-102	CAPACITOR,PEMF,.047,100V,10%
C9	1	S13490-42	CAPACITOR,TAEL,1.0,35V,10%
C11	1	S16668-5	CAPACITOR,CEMO,.022,50V,20%
D1, D9, D10, D11, D12	5	T12199-1	DIODE,AXLDS,1A,400V
D2, D3	2	T12199-2	DIODE,AXLDS,1A,1000V
DZ1	1	T12702-4	ZENER DIODE,1W,20V,5%,1N4747A
J1	1	T13160-65	CONNECTOR,MOLEX,PCB,6-PIN
J2	1	T13160-5	CONNECTOR,MOLEX,PCB,6-PIN
PT1	1	T12737-5	TRANSFORMER,PULSE,3-WINDING,1:1:1
Q1, Q2	2	T12704-68	TRANSISTOR,NPN,TO226,0.5A,40V,2N4401
QU1	1	T12707-4	TRANSISTOR,PUT,TO92,2N6027
R1, R15, R16	3	T12731-8	RESISTOR,METAL FILM,1/2W,10K,2%
R2	1	T12731-34	RESISTOR,METAL FILM,1/2W,22K,2%
R3	1	T12731-14	RESISTOR,METAL FILM,1/2W,2.7K,2%
R4	1	S19400-1620	RESISTOR,MF,1/4W,162,1%
R5	1	T14650-1	RESISTOR,WW,15W,1.5K,5%,SQ
R6	1	T12731-6	RESISTOR,METAL FILM,1/2W,33K,2%
R7, R9	2	T12731-17	RESISTOR,METAL FILM,1/2W,4.7K,2%
R8	1	T14648-11	RESISTOR,WW,5W,4.7K,5%,SQ
R10	1	T10812-62	TRIMMER,ST,1/2W,500, 10%,LINEAR
R11	1	T10812-77	TRIMMER,ST,1/2W,20K, 10%,LINEAR
R12	1	T12731-2	RESISTOR,METAL FILM,1/2W,27K,2%
R13	1	T12731-31	RESISTOR,METAL FILM,1/2W,47,2%
R14	1	T12731-11	RESISTOR,METAL FILM,1/2W,2.2K,2%
R17	1	T13165-11	RESISTOR,WW,5W,2.7,5%
R18	1	S10404-69	RESISTOR,WW,5W,2.5K,5%
R19	1	T12731-22	RESISTOR,METAL FILM,1/2W,3.3K2%
SCR1, SCR2	2	S15161-6	SCR,TO220,12A,400V,2N6397
TP1, TP2	2	T13640-11K	MOV,150VRMS,45J,14MM

CAPACITORS = MFD/VOLTS
RESISTOR = OHMS

NOTES:
N.A. SPACE RESISTOR OFF BOARD .16/.10.
N.B. DO NOT COAT WITH ENCAPSULATION MATERIAL.
N.C. STAND OFF FROM BOARD .25 MAX. INSPECT BEFORE AND AFTER ENCAPSUALTION, THERE MUST BE NO CRACKS IN THE EPOXY CASE PARTICULARLY AT THE POINT WHERE THE LEADS ENTER THE CASE.
N.F. POSITION C3 TOUCHING TP1.
N.H. MOUNT DIODE ASSEMBLY TO BOARD WITH ITEM 5 AT MIDDLE DIODE.
N.J. MAKE CONNECTIONS FROM DIODES TO BOARD WITH ITEM 8. MAINTAIN .20 MIN. CLEARANCE BETWEEN JUMPERS AND HEATSINK ASSEMBLY.
N.L. TP1 TO BE POSITIONED IMMEDIATELY PRIOR TO TEST SO THAT .10 MIN. SPACE EXISTS BETWEEN CENTER OF TP1 AND MOLEX.
N.M. PRINT "L7454-3" ON ITEM 16 AND APPLY TO ITEM 1 AS SHOWN. PLACE ON TOP OF "L7454-2" PRINTED ON PC BOARD BLANK.

REVISION CONTROL

L7454-3B2

PART NO. IDENTIFICATION CODE
TEST PER E2209-T
COAT WITH E1844
SCHEMATIC REFERENCE: M21076-3B2

MAKE DETAIL

MANUFACTURE PER E1911
MAKE BLANK FROM S19399 (4 BOARDS PER PANEL)

2 LAYER BOARD BLANK PANEL
SEE ELECTRONIC FILE FOR ADDITIONAL INFORMATION.

FOR PARTS ORDERS:
INCLUDE T11590-90 TAG.
SEAT TRIMMERS WITH E4018.

MANUFACTURING TOLERANCE PER E2056 UNLESS OTHERWISE SPECIFIED TOLERANCE ON 2 PLACE DECIMALS IS ± .02 in. (± 0.5 mm) ON 3 PLACE DECIMALS IS ± .002 in. (± 0.05 mm) ON ALL ANGLES IS ± .5 OF A DEGREE MATERIAL TOLERANCE ("t") TO AGREE WITH PUBLISHED STANDARDS. DO NOT SCALE THIS DRAWING	CONTROL: CLEVELAND DRAWN BY: fivory ENGINEER: - APPROVED: -	SCALE: 2:1 IF PRINTED @ A2 SIZE UNITS: INCH	EQUIPMENT TYPE: LT-7 TRACTOR SUBJECT: TRAVEL P.C. BOARD ASSEMBLY MATERIAL DISPOSITION: NA APPROVAL DATE: - PROJECT NUMBER: CRM41759 REFERENCE: L7454-2	PAGE 1 OF 1	DOCUMENT NUMBER: L7454-3	DOCUMENT REVISION: A.01

NOTE: Lincoln Electric assumes no responsibility for liablilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.

Return to Section TOC
Return to Master TOC